

The logo for Onyx Solar, featuring the word "onyx" in a lowercase, sans-serif font with a power symbol (a circle with a vertical line) above the "o", and the word "SOLAR" in a smaller, uppercase, sans-serif font to the right. The logo is white and is set against a black, rounded square background.

onyx
SOLAR

PROJECTS & REFERENCES

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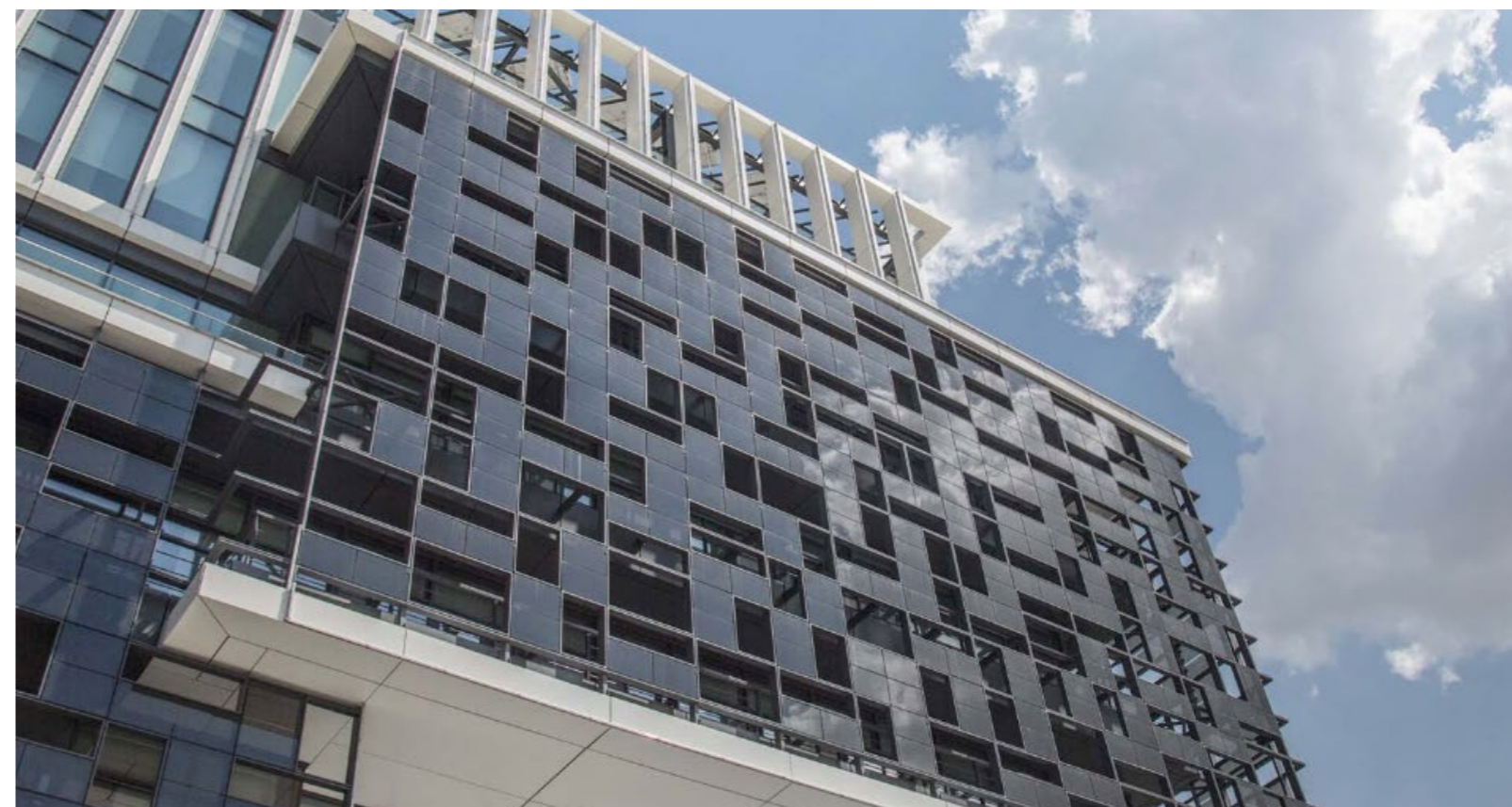
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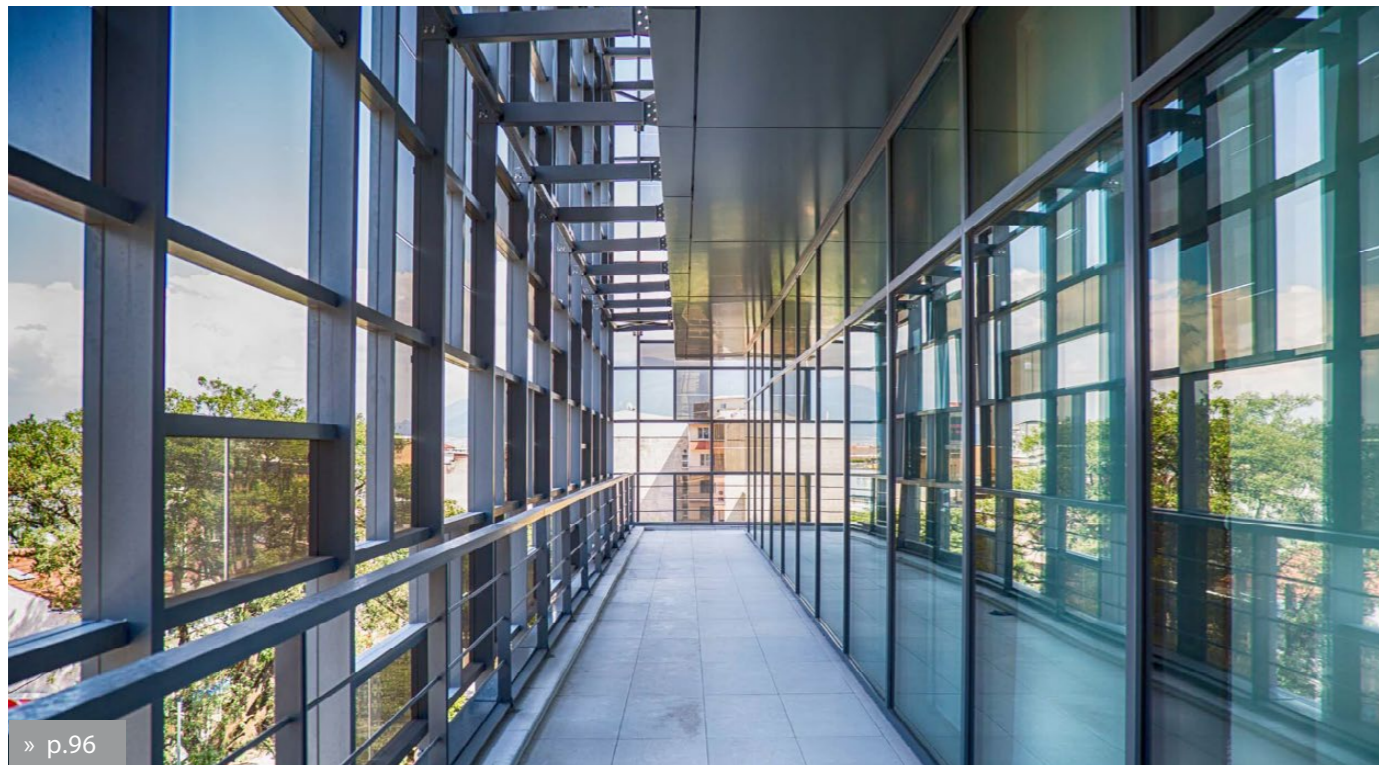
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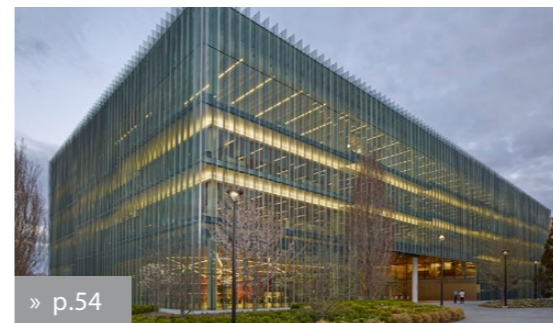
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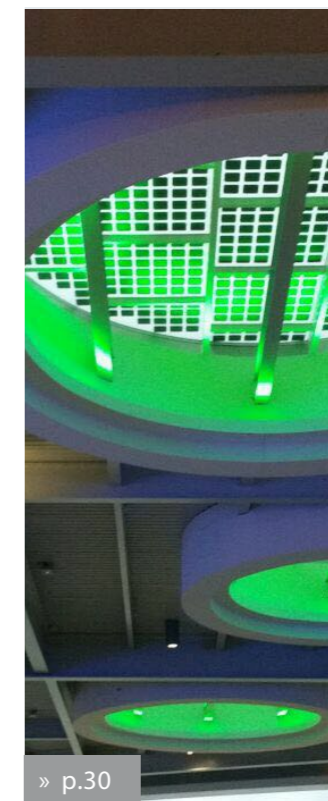
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Onyx Solar® is the world leader in the manufacture of photovoltaic glass for buildings. A transparent or coloured glass capable of generating clean, free energy from the sun, for installation on façades, in windows, skylights or even floors, enabling the buildings of our cities to generate their own energy for a minimal outlay.

Our aim is to enable the buildings of the future to be self-sufficient from an energetic point of view, a key factor in the struggle against climate change, as buildings are responsible for 70% of the consumption of electrical energy on our planet.

Thus, our photovoltaic glass achieves an average reduction of 48% in the energy consumption of buildings, attaining an electrical cost of less than one cent. This investment is not only a huge step towards sustainability, but it is also highly worthwhile financially, as the outlay is recovered in a matter of months, and it provides an average Internal Rate of Return of 70%.

With over a hundred projects executed in the five continents, we have taken part in large-scale projects for leading companies such as Samsung, Coca-Cola, Pfizer or Novartis, who are already enjoying the benefits of our glass in their buildings. We provide advice to preeminent architects worldwide, such as Norman Foster, Frank Gehry, SOM, KPF, ASGG or Rafael Vinoly, and we have worked for the most important construction companies in the world, such as ACS, Skanska, Turner, Jacobs or Ferrovial.

This catalogue shows some of the projects of which we are most proud. We hope you enjoy reading it as much as we enjoyed executing each one.

Welcome to the revolutionyx,
Álvaro Beltrán
Founder of Onyx Solar®



CRYSTALLINE SILICON GLASS



Onyx Solar® is a company devoted to the design, manufacture and marketing of photovoltaic glass, made of both amorphous silicon and crystalline (mono- and polycrystalline) silicon. A glass which behaves, from a structural point of view, like the conventional glass used in construction, but it also generates clean, free electrical power from the sun while providing considerable thermal insulation.

The configurations possible are practically infinite in number, based on the type of glass, the size, thickness, the degree of semi-transparency and the colour, so as to adapt to the requirements of each project.



In construction solutions where the generation of the maximum quantity of energy per m² prevails, the choice of crystalline silicon glass is more common.

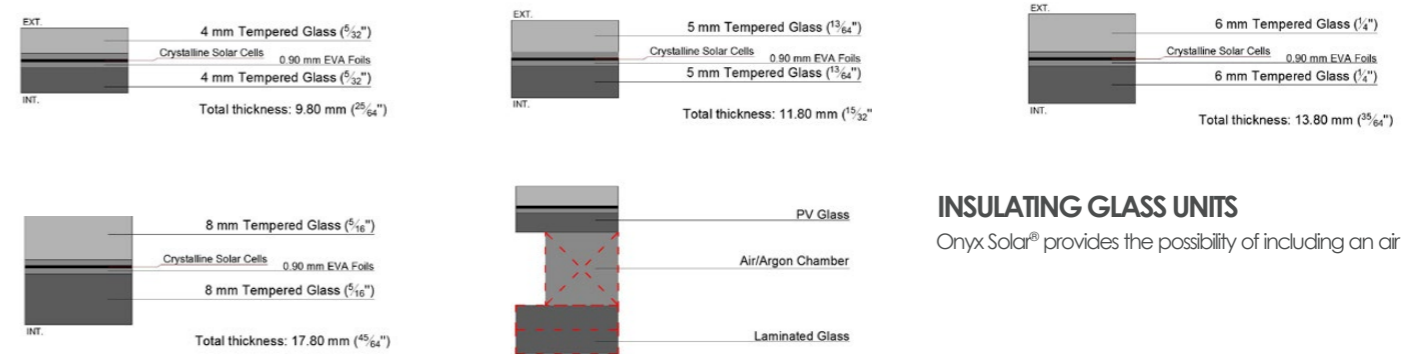
Its power capacity is defined fundamentally by the number of cells employed per module. **Each crystalline silicon glass module has a power capacity normally varying between 80 and 160 Wp/m²**, depending on the cell density required by the design, to enable the entry of more or less daylight.

Advantages:

- Greater nominal power capacity per square metre (Wp/m²).
- Less surface area of the installation for the same power capacity.
- Greater efficiency (up to 16%).

CONFIGURATION & THICKNESS

Onyx Solar® offers the following standard configuration and thickness:

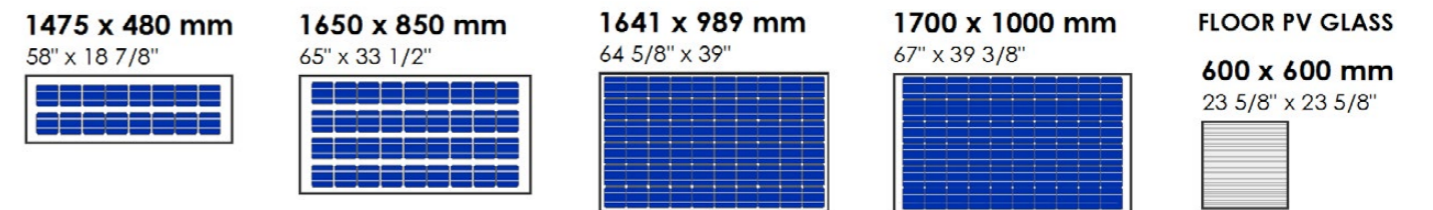


INSULATING GLASS UNITS

Onyx Solar® provides the possibility of including an air

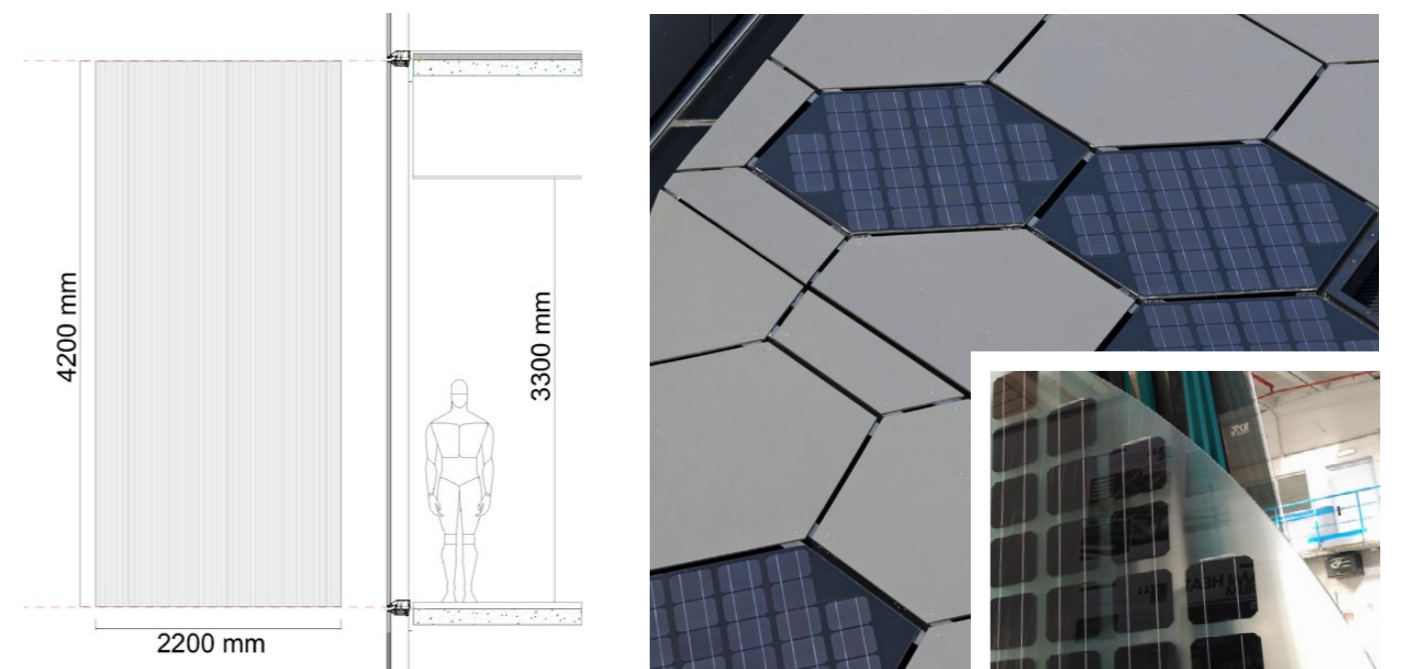
STANDARD SIZES

Onyx Solar® offers the following standard sizes:



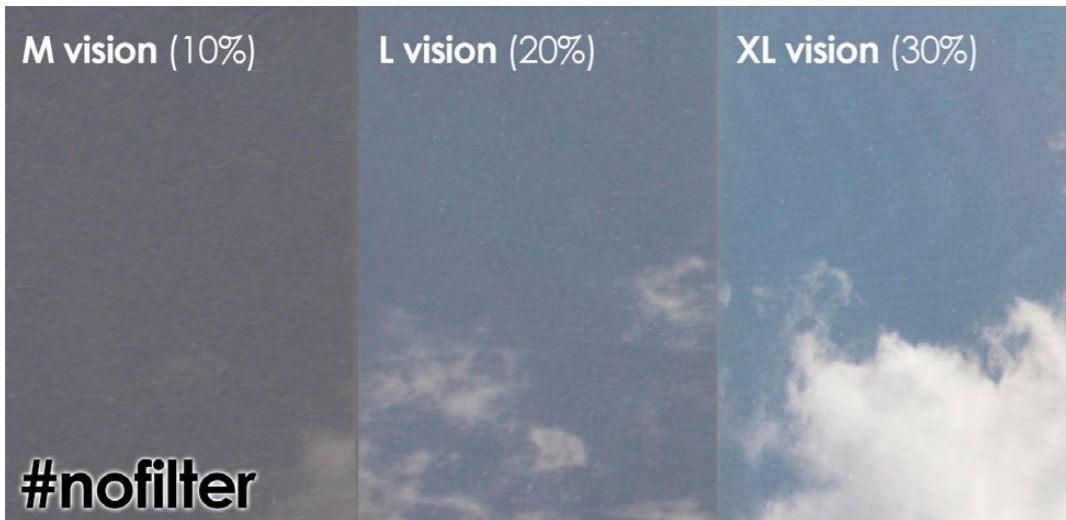
100% PERSONALIZED

At Onyx Solar® we are flexible with regard to sizes, shapes and configurations. We personalize the modules, adapting them entirely to the specific requirements of each project. Onyx Solar®'s panes may be as large as 4200mm x 2200mm.



The largest photovoltaic glass in the market

AMORPHOUS SILICON GLASS



Ávila, 29th April 2016
 Camera: Olympus Digital Camera E-450

Exposure: 1/100S
 Speed ISO: ISO -200
 Focal length: 25mm
 Distance between the camera and the glass: 3m
 No Flash
 Maximum aperture: 3.61328125



Exposure: 1/15S
 Speed ISO: ISO -400
 Focal length: 29mm
 Distance between the camera and the glass: 1,5m
 No Flash
 Maximum aperture: 3.61328125

Amorphous silicon glass is ideal for conditions of diffuse radiation.

The glass is manufactured opaque or with various degrees of semi-transparency: M vision (10%), L vision (20%) or XL vision (30%), which enables the passage of daylight into the building while its occupants enjoy the view of the exterior.

With Onyx Solar's transparent photovoltaic glass it is possible

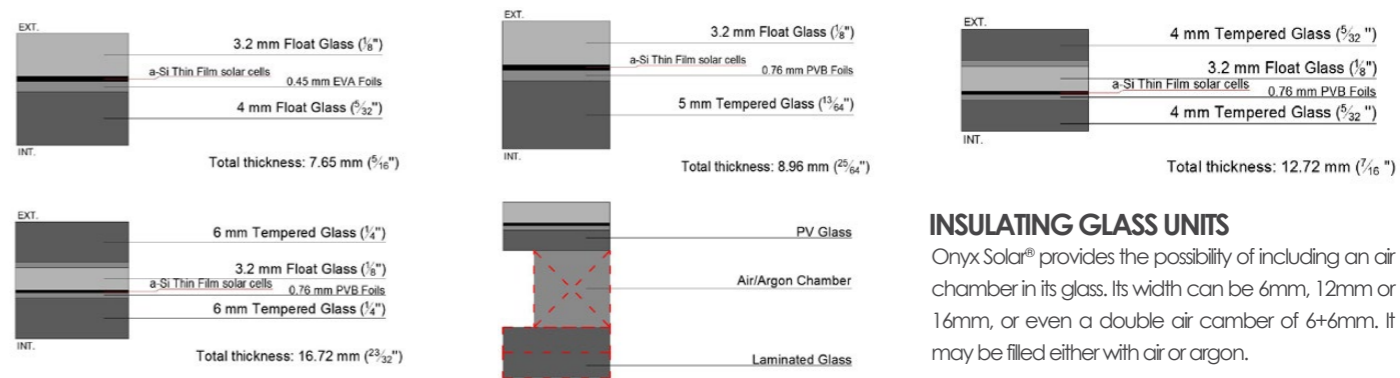
to exploit the daylight to light a building while filtering out the majority of the harmful radiation (ultraviolet and infrared).

Advantages:

- Greater energy production (kWh) at the same installed power capacity (kWp) under conditions of diffused radiation and high temperatures.
- Enables a more uniform aesthetic integration.

CONFIGURATION & THICKNESS

Onyx Solar® offers the following standard configuration and thickness:

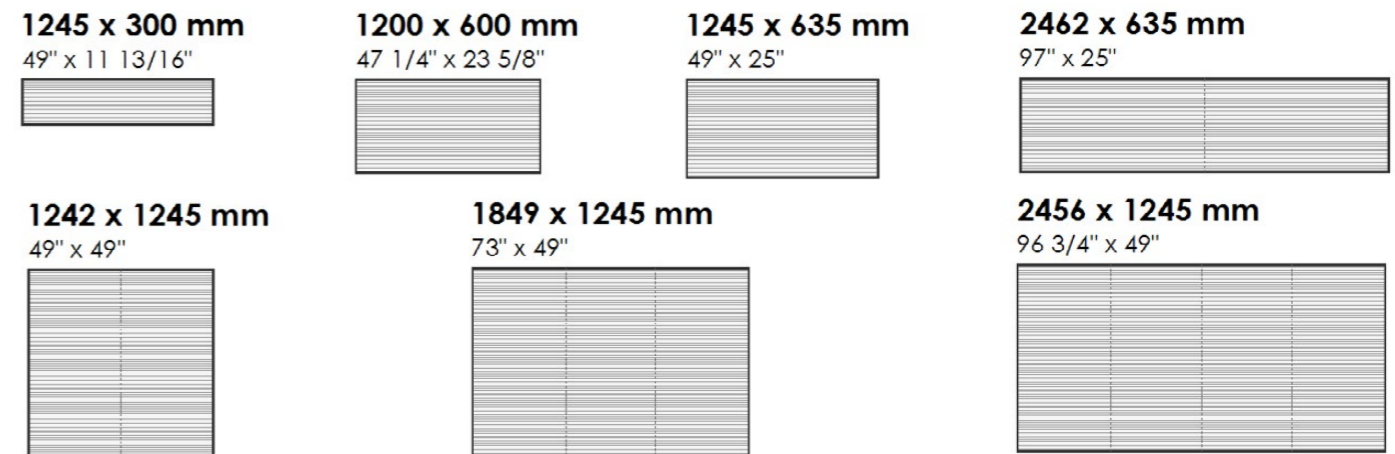


INSULATING GLASS UNITS

Onyx Solar® provides the possibility of including an air chamber in its glass. Its width can be 6mm, 12mm or 16mm, or even a double air chamber of 6+6mm. It may be filled either with air or argon.

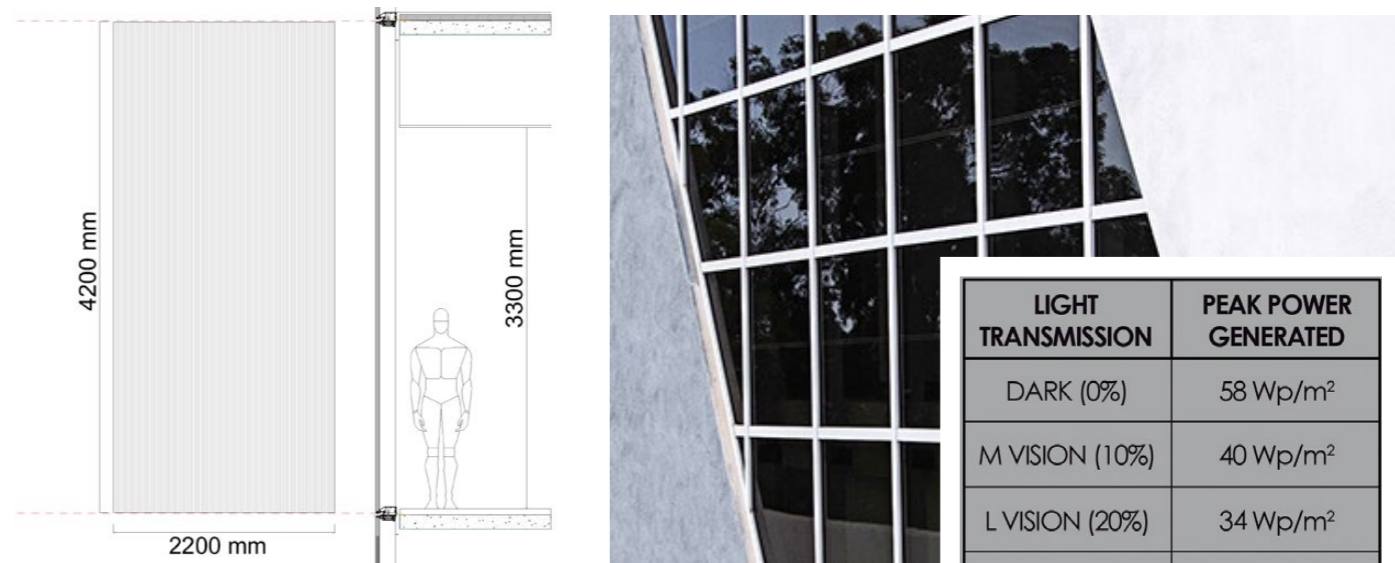
STANDARD SIZES

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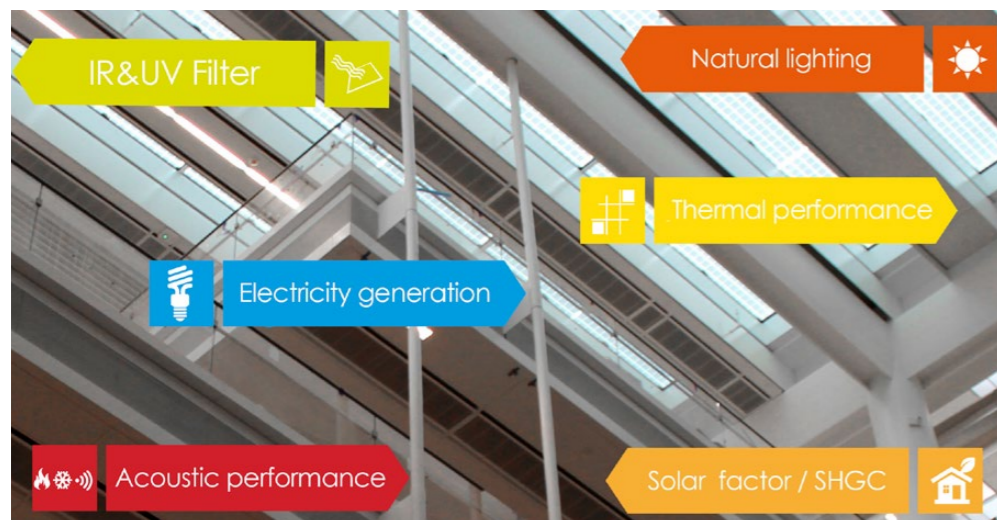


The largest photovoltaic glass in the market

LIGHT TRANSMISSION	PEAK POWER GENERATED
DARK (0%)	58 Wp/m ²
M VISION (10%)	40 Wp/m ²
L VISION (20%)	34 Wp/m ²
XL VISION (30%)	28 Wp/m ²

LOW-E PHOTOVOLTAIC GLASS

LOW-EMISSION (LOW-E) PHOTOVOLTAIC GLASS



Why do Onyx Solar®'s products add value to any building?

Photovoltaic glass modules produce clean, free energy from the sun, enable the entry of daylight, filter out the harmful components of solar radiation, provide thermal and acoustic insulation, and contribute to a personalised, innovative design which integrates perfectly into any type of building.

Onyx Solar® has developed the first photovoltaic low-emissivity or low-e glass. In addition to generating clean energy from the sun, low-e photovoltaic glass surpasses the properties of a similar conventional glass:

INSULATION PROPERTIES

These are expressed by the thermal transmittance of the glazing which, as we have seen before, is also known as "U-value". Let us remember that this parameter means the amount of heat that traverses the glazing when there is a difference in temperature between its two sides. As this value decreases, our glass will be more insulating, and therefore our building will be more efficient, providing savings in energy and money. In this regard, Onyx Solar®'s Low-E panes can offer values of up to 0.6 W/m2K, equal to the best Low-E glass panes on the market.

PRODUCTION OF CLEAN ENERGY

It should not be forgotten that these are glass modules which produce electrical energy when sunlight falls on them. This is due to the micrometric active layers of photovoltaic material deposited on one of the sides of the glass. For example, only 100 square metres of photovoltaic glass in the city of Los Angeles could power over 250 lights during working hours for 25 years. This clean, cost-free energy from the sun which can provide significant financial savings for the consumer, who continually has to endure ever-greater increases in the cost of electricity.



Onyx Solar®'s Low-E photovoltaic glass has been distinguished as "The Most Innovative Glass in 2015". An honour awarded by the American National Glass Association.

For further information on this innovative construction material, please download the **Low-E Photovoltaic Glass Technical Guide**. As well as view more detailed information about the **optical and thermal properties of Onyx Solar®'s glass**.

	ONYX SOLAR®	LOW-E GLASS	CONVENTIONAL GLASS	CONVENTIONAL PV MODULE
Selective IR Filter	✓	✓	✗	✗
Selective UV Filter	✓	✓	✗*	✗
Solar factor / SHGC	✓	✓	✗	✗
Natural lighting	✓	✓	✓	✗
Thermal performance U < 2 W/m²K U < 0,35 BTU/hft²F°	✓	✓	✗	✗
Acoustic performance	✓	✓	✓	✗
Electricity generation	✓	✗	✗	✓
Aesthetic integration in buildings	✓	✓	✓	✗

* The UV filter can only be achieved by laminated glass.

SELECTIVE FILTRATION OF INFRARED RADIATION

It reduces the transmission of infrared radiation by up to 90% compared with a conventional laminated glass.

OPTIMISED SOLAR FACTOR

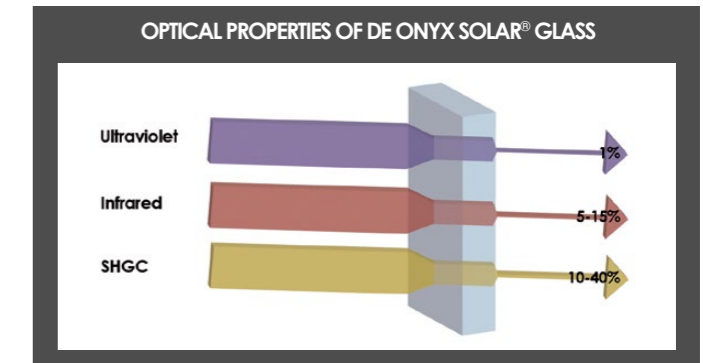
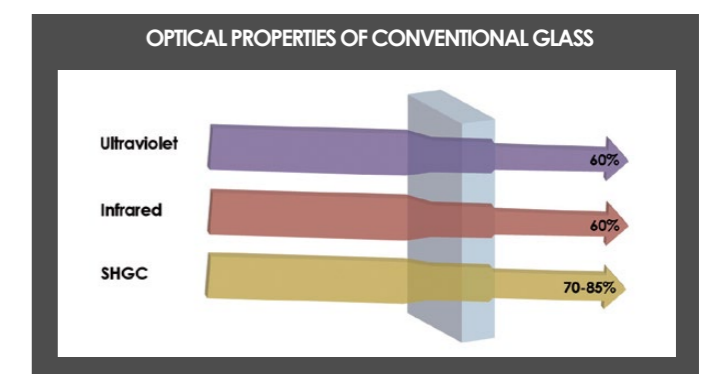
This optimization of optical properties is related to the solar factor, also known as "g-value" or SHGC (Solar Heat Gain Coefficient). This coefficient tells us the amount of energy that a glazing will allow into our building with regard to the energy reaching it in the form of solar radiation. This factor is critical for the obtaining of interior thermal comfort in a building. For example, a high g-factor might cause the temperature to rise too high due to the greenhouse effect, while low values will prevent this from happening, particularly in a hot climate. In this respect, the measurements of Onyx Solar®'s ThinFilm transparent photovoltaic glass display a solar factor of between 10% and 40%, which makes them ideal candidates to achieve control over the interior temperature.

NATURAL LIGHTING

As these are transparent glass, they enable the natural lighting of the building. The visible light entering through Onyx Solar®'s ThinFilm photovoltaic glass, being of a more diffuse nature, favours a more user-friendly interior illumination. Its transparency ranges from 10% to 30%, which is usually enough to achieve good illumination.

SELECTIVE ULTRAVIOLET FILTER

The architectural glass panes developed by Onyx Solar® filter out 99% of the ultraviolet radiation (UV) which may have a harmful effect on interiors, furniture and persons.



COLORS

CUSTOM COLORS



If there's anything that characterises Onyx Solar®, it's innovation in the design of the photovoltaic materials we use.

Onyx Solar®'s glass, in addition to their sustainability and their efficiency, stand out due to their unlimited range of configurations, to which we can add the possibility of including colours or combinations of colours, thus **adapting to the design of each project**.

Starting from the different categories of colours that may be seen below (red, orange, grey, white, black, yellow, green, blue, purple) we can provide manifold colours, adapting to the personalised requirements of our clients.

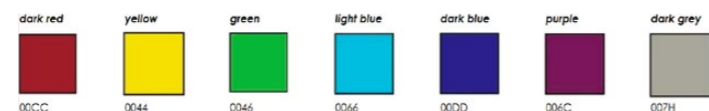
These coloured photovoltaic glass can be integrated into any construction solution, generating an added value, due to the **exclusive and distinguishing design** of this constructive element that generates clean and fee energy thanks to the sun.



Category A



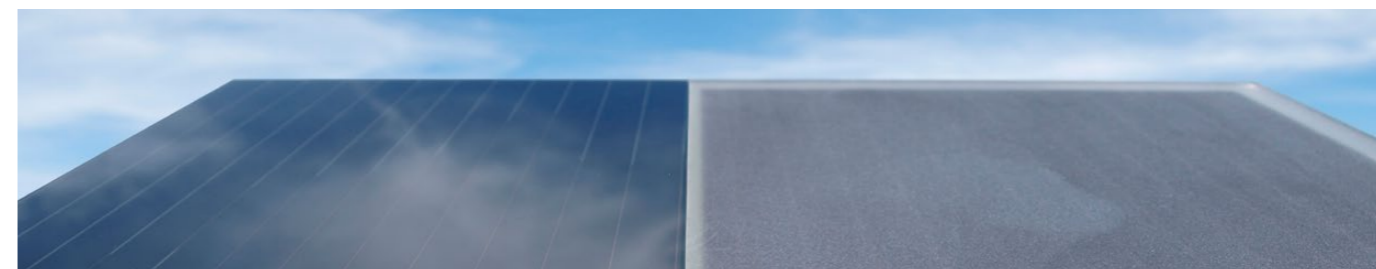
Category B



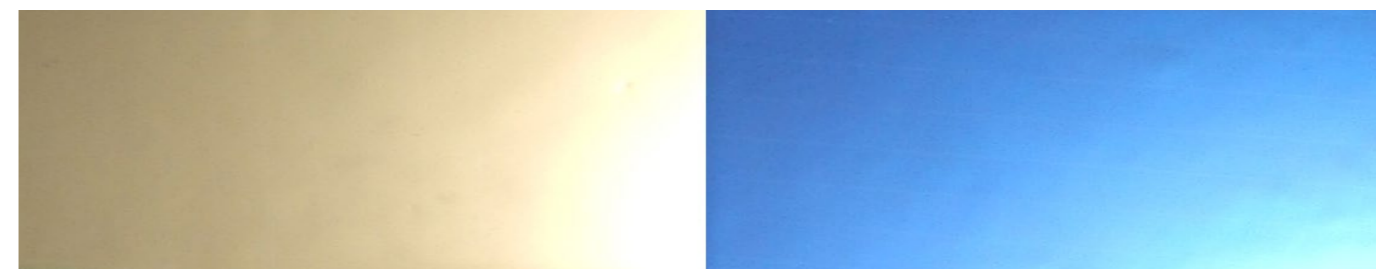
FINISHES

CUSTOM FINISHES

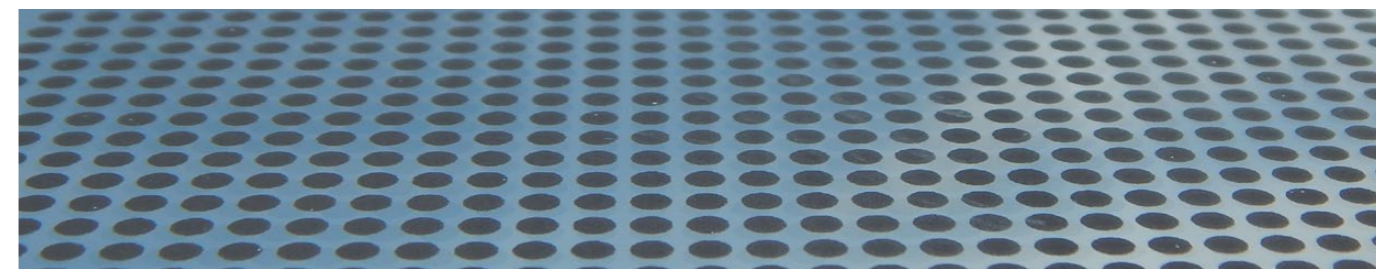
GLOSS OR MATT



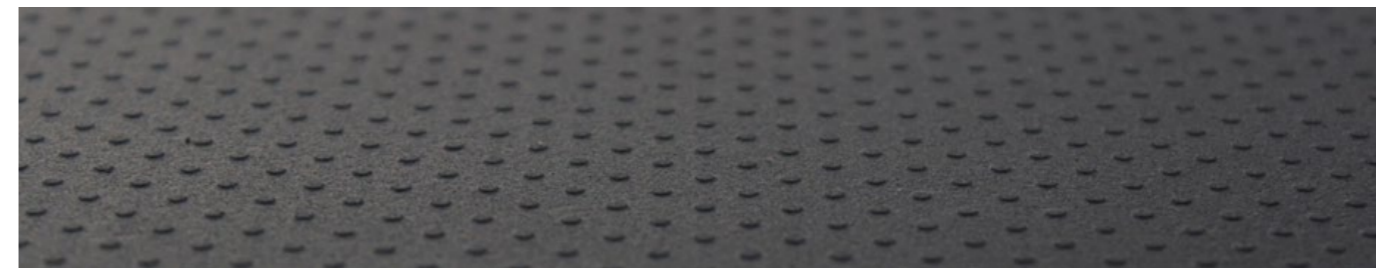
METALLIC HINT GLASS



FRIT PATTERNS

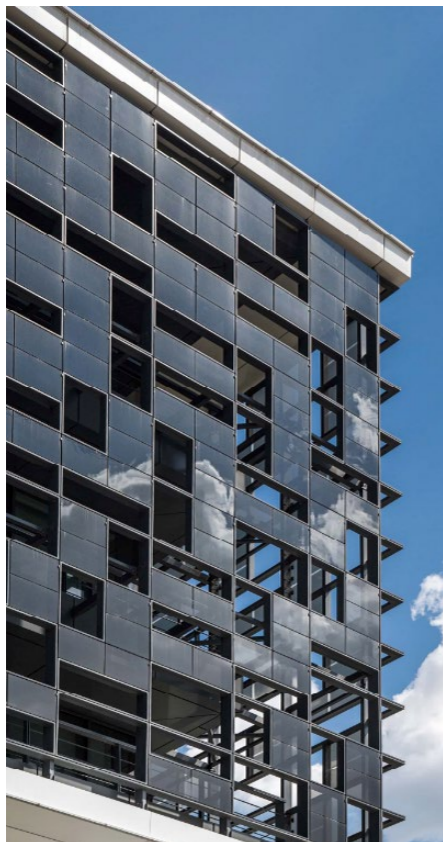


ANTI-SLIP



SOLUTIONS

PERFECT INTEGRATION



SKYLIGHT



The **Skylight system** ensure an optimized PV electrical generation adding multifunctional passive bioclimatic properties of thermal inner comfort since most of the UV and infrared radiation from the sun will be harvested by the silicon-based material (solar filter effect).

Moreover, the air chamber of the insulating glass guarantees **best thermal performance** in terms of U and g values.

In other words, the skylight provides a **multifunctional solution** where not only energy is being generated in-situ, but also natural illumination is being provided implementing solar control by filtering effect, avoiding infrared and UV irradiation to the interior (enhancing thermal comfort and avoiding interior aging).

CANOPY



A **photovoltaic canopy** constitutes a constructive solution which combines energy generation, solar and adverse climatologic conditions protection.

The **energy** generated by the system can either feed any building within its surroundings or get connected to the grid, leading in any case to an important economic profit.

The top of the photovoltaic canopy is **customized** for each project according to the preferred aesthetic value appearance and to its **integration** within the urban characteristics.

Orientation, slope options, sizes or wind loads are some key variables that should be measured accurately in order to get a correct design for the main structure.

CURTAIN WALL



Curtain walls offer architects a multitude of possibilities for the integration of photovoltaic solar energy into buildings in an efficient and ecological manner.

Photovoltaic curtain wall provides a **multifunctional solution** where not only clean and free energy is being generated in-situ, but also natural illumination is being provided implementing solar control by filtering effect, avoiding infrared and UV irradiation to the interior (enhancing thermal comfort and avoiding interior aging).

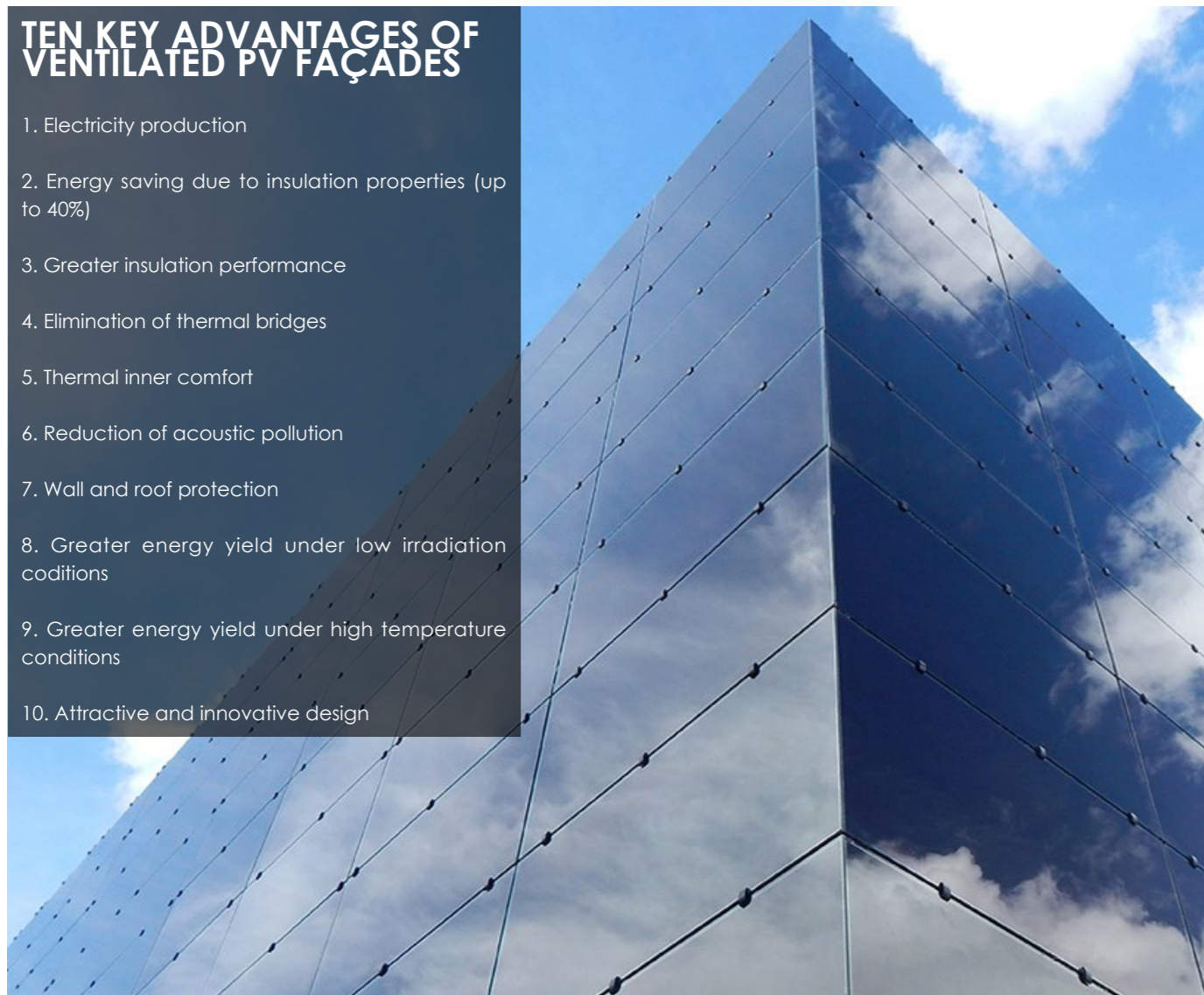
The **large variety in form, structure and colour** of transparent photovoltaic glass, combined with the aluminum frames, provides a free reign of creativity for architects so they can create designs which unite elegance, efficiency and energy saving.

Onyx Solar can **customize the photovoltaic glass** to supply it in different sizes, colours and degrees of transparency. These characteristics mean that it is the ideal material for installation as a photovoltaic curtain wall.

VENTILATED FAÇADE

TEN KEY ADVANTAGES OF VENTILATED PV FAÇADES

1. Electricity production
2. Energy saving due to insulation properties (up to 40%)
3. Greater insulation performance
4. Elimination of thermal bridges
5. Thermal inner comfort
6. Reduction of acoustic pollution
7. Wall and roof protection
8. Greater energy yield under low irradiation conditions
9. Greater energy yield under high temperature conditions
10. Attractive and innovative design



Contemporary architecture is showing an increasing interest in the different materials available for use in ventilated façades and roofs.

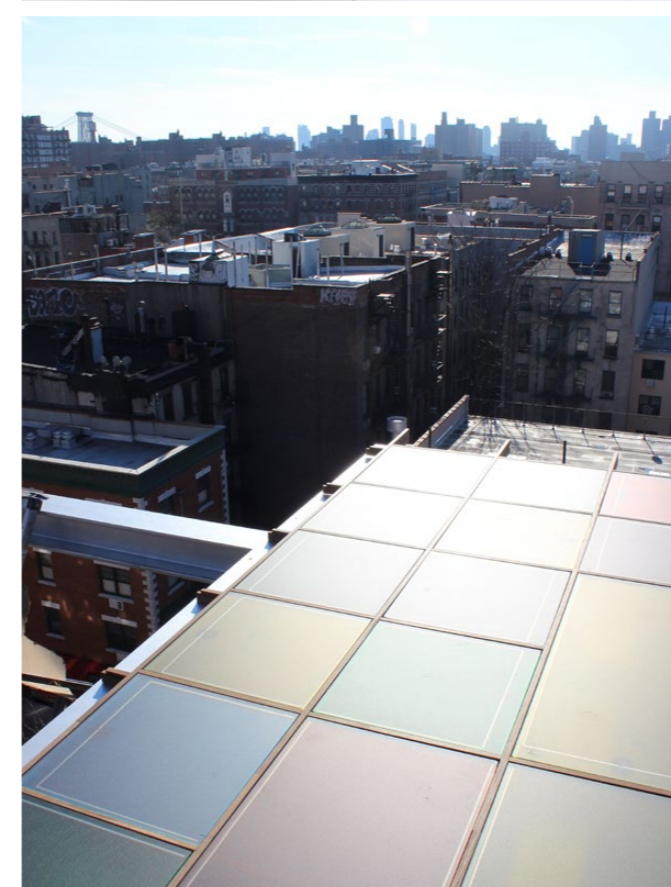
Inspired by this rise in interest, Onyx Solar has designed a **photovoltaic ventilated façade and roof system**, a product with undeniable aesthetic value and unbeatable in terms of heat insulation that generates free electricity from the sun.

The **generated electricity** can be translated directly to the mains supply system, thus being marketed to the large suppliers, or be used for personal consumption (isolated system). **The thermal surrounding methods can result in a 25-40% reduction of the energy consumed by a building.**

In addition to the obvious environmental benefits, from a **financial point of view**, depending upon the type of building and its location, our ventilated façades and roofs can achieve an Internal Return Rate (IRR) greater than 25% and an outstanding payback time.

WALKABLE FLOOR

A NON-SLIP GLASS SURFACE



Onyx Solar has released to the market a **walkable PV floor**, another innovative solution for integrating solar energy into buildings.

Thanks to the advance in our R&D&I department, this photovoltaic solution comes with the **highest quality standards**: It complies with the anti-slip regulation, it supports 400 kg in point load test and reaches almost the same efficiency levels than any other photovoltaic building material.

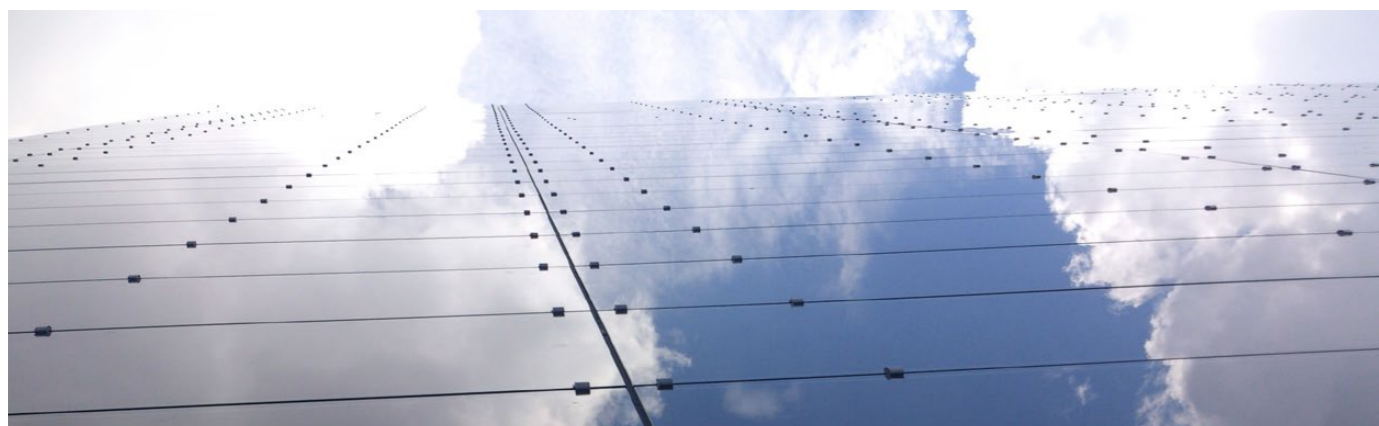
Equally important is the **appealing design** of this solution, offering a fantastic range of configuration possibilities in color (or combination of colors) and the chance to use a LED backlight system to enhance the aesthetic value.

This PV pavement is a really appealing product for architects as **it can be integrated in any project and environment** without renouncing design and aestheticism. What's more, it combines passive elements (avoided CO2 emissions) with active elements (power generation), greatly reducing the building's environmental impact.

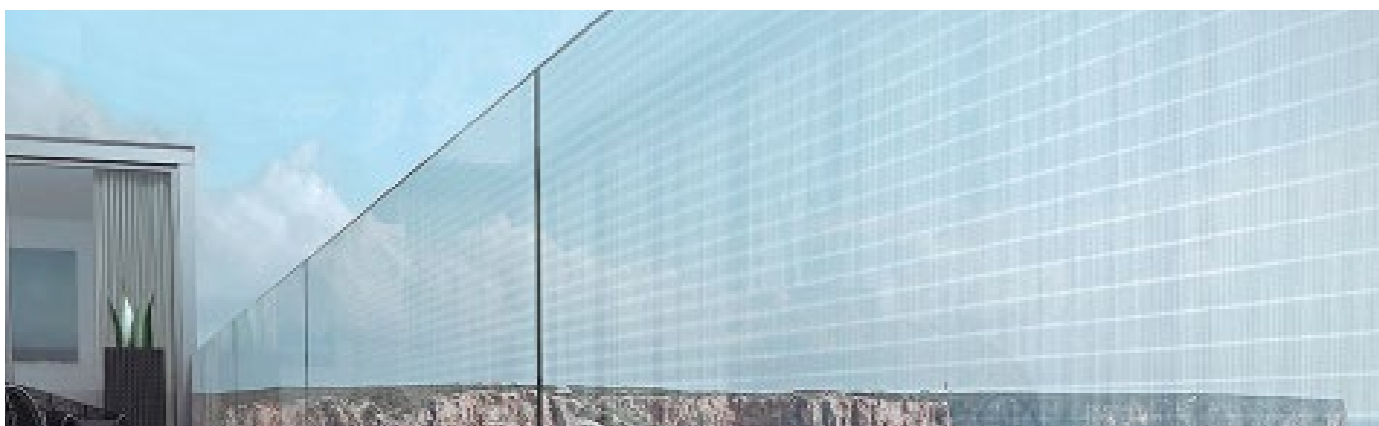
PARKING LOT



SPANDREL



BALUSTRADE



Perfect integration into any solution

FURNITURE

Onyx Solar® is a pioneer in the development of a photovoltaic kit to enable outdoor furniture to generate clean, free energy from the sun. In this way, tables, canopies, benches, lamp-posts, floors and other items of outdoor furniture enable the recharging of electronic devices while saving the users' time and money, and preventing the release of CO₂ and other greenhouse gases into the atmosphere.

The photovoltaic kit developed by Onyx Solar® **consists of a photovoltaic glass module and the electrical material necessary for the connection of electronic devices** (mobile telephones, laptop computers, tablets, etc.) **via a USB port**. It further comprises a battery to store the power generated during the day for its use at night. This simple system enables the convenient and environmentally sustainable

recharging of electronic devices, meeting an ever more important need nowadays.

The photovoltaic glass employed in the kit may be integrated in the furniture itself, or a walkway made of photovoltaic tiles may be used to generate the energy. In both cases, **the glass may be either amorphous or crystalline silicon**. If made of amorphous silicon, it is ideal for shaded areas, as diffused light can be captured, while crystalline silicon enables the generation of more power per m². Both feature a modern, technological appearance.

This kit is available in different sizes of module and in a wide range of colours, enabling the designers to integrate it in the most aesthetically suited manner in all types of furniture.



TANJONG PAGAR

PHOTOVOLTAIC CANOPY

Located in the midst of Singapore's financial centre, **this 64-storey tower is the tallest building in the country**. Designed by **SOM**, the New York-based architecture firm, its construction was realised by the Korean multi-national company Samsung.

Onyx Solar® is taking part in this project with the integration of a large photovoltaic pergola of over **2,600 m²** located at the entrance to the building, with an installed power capacity of **125 kWp**. The pergola features **858 amorphous silicon photovoltaic glass modules** measuring **2,456 x 1,245 mm**, with a **semi-transparency degree of 10% (M vision)**, which will enable the building to supply over **7,000 lights** per day thanks to the sun (**125,810 kWh** per year).

This energetic efficiency measure contributes to the building obtaining the **Greenmark** and the **Platinum LEED certification**. Furthermore, the building has already been granted a **2015 WAN AWARD** in the "Future Projects" category.



"At **SOM** we are committed to excellence, which translates to high-value innovative designs. We have the opportunity to influence positively the fundamental problems currently facing humanity. Promoting renewable energy and increasing the levels of energetic efficiency, at **SOM** we are able to collaborate effectively with diverse solutions in the struggle against climate change".

"We believe that sustainability inspires great architectural works. New, spectacular designs are emerging which have a minimal impact on the environment".



“ At Samsung, we undertake the responsibility of carrying out our activity with the aim of enriching our planet.

Our sustainability policy is based on the continued improvement of the environment throughout our activities, naturally including the efficient use of energy at our facilities".

Samsung sustainability report, 2015





TOTAL AREA	2.624 M2
ELECTRICITY GENERATED PER YEAR	125.810 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	7.169 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	84.290 CO ₂
BARRELS OF OIL SAVED PER YEAR	76 Barrels

>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN SINGAPORE

- <0,01€** Energy cost
- 28%** Reduction in HVAC energy demand
- 86%** Internal Rate of Return
- <1 year** Payback

(*) Download the complete study [here](#).

Glass dimensions: 2456x1245 mm

N. Units: 858

VLT: M Vision

Wp per unit: 145

Technology: a-Si

General contractor: Samsung

Architect: SOM

Client: Tanjong Pagar

Best of What's New 2015
Onyx Solar®'s glass has been

rewarded by the centenarian scientific dissemination journal "Popular Science" as the **most innovative product of the year**, together with Tesla's Powerball batteries.



SOM is the architecture firm entrusted with the design of the Tanjong Pagar.

Located in the midst of Wall Street, SOM has designed buildings as prominent as the **Burj Khalifa** in Dubai, which at 828 metres is currently the tallest building in the world, or the **One World Trade Center** in New York.

Over 15,000 buildings located in 50 countries bear witness to the awesome experience of this emblematic architecture studio.

DUBAI FRAME

PHOTOVOLTAIC FAÇADE



The **Dubai Frame** is an impressive rectangular picture-frame-shaped building, **150 metres tall and 105 metres wide**, located in the Zabeel Park in Dubai. Its strategic location provides over 2 million visitors with spectacular views of the city's other architectural jewels, framed on the horizon. It has therefore been considered one of the world's new attractions in 2015, and one of the most original skyscrapers.

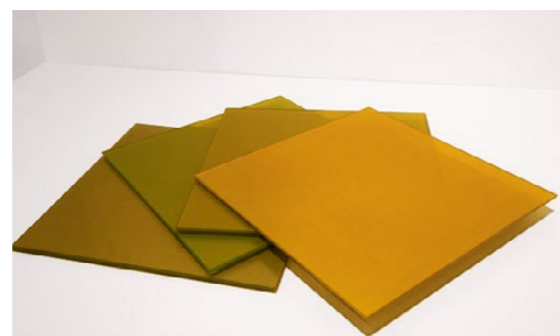
Onyx Solar® has participated in this project with the integration in the façade of **1,200 m²** of amorphous silicon photovoltaic glass. Approximately 2,500 modules measuring **485 x 985 mm** of a **triple safety laminate** have been manufactured in a yellow-gold colour with a **semi-transparency degree of 20% (L vision)**. The total installed power capacity reaches 38 kWp and will enable the building to generate a large proportion of the energy it needs for its operation.

This multi-functional glass, besides contributing to the creation of a sustainable building fed to a considerable extent by solar energy, provides the frame with undeniable aesthetic value due to its yellow colour. It also filters out ultraviolet and infrared radiation, thus preventing the greenhouse effect so common in cities with hot climates and improving the comfort of its occupants. Thanks to the integration of Onyx Solar's photovoltaic glass in the envelope of the building, considerable energy savings may be achieved in the air handling of the same.

ONYX SOLAR®

“ *The choice of using photovoltaic glass, which produces clean energy from the sun, is witness to a change of attitude in the government and to Dubai's approach to sustainability”.*

Abdullah Raffia, Dubai government engineering and planning.

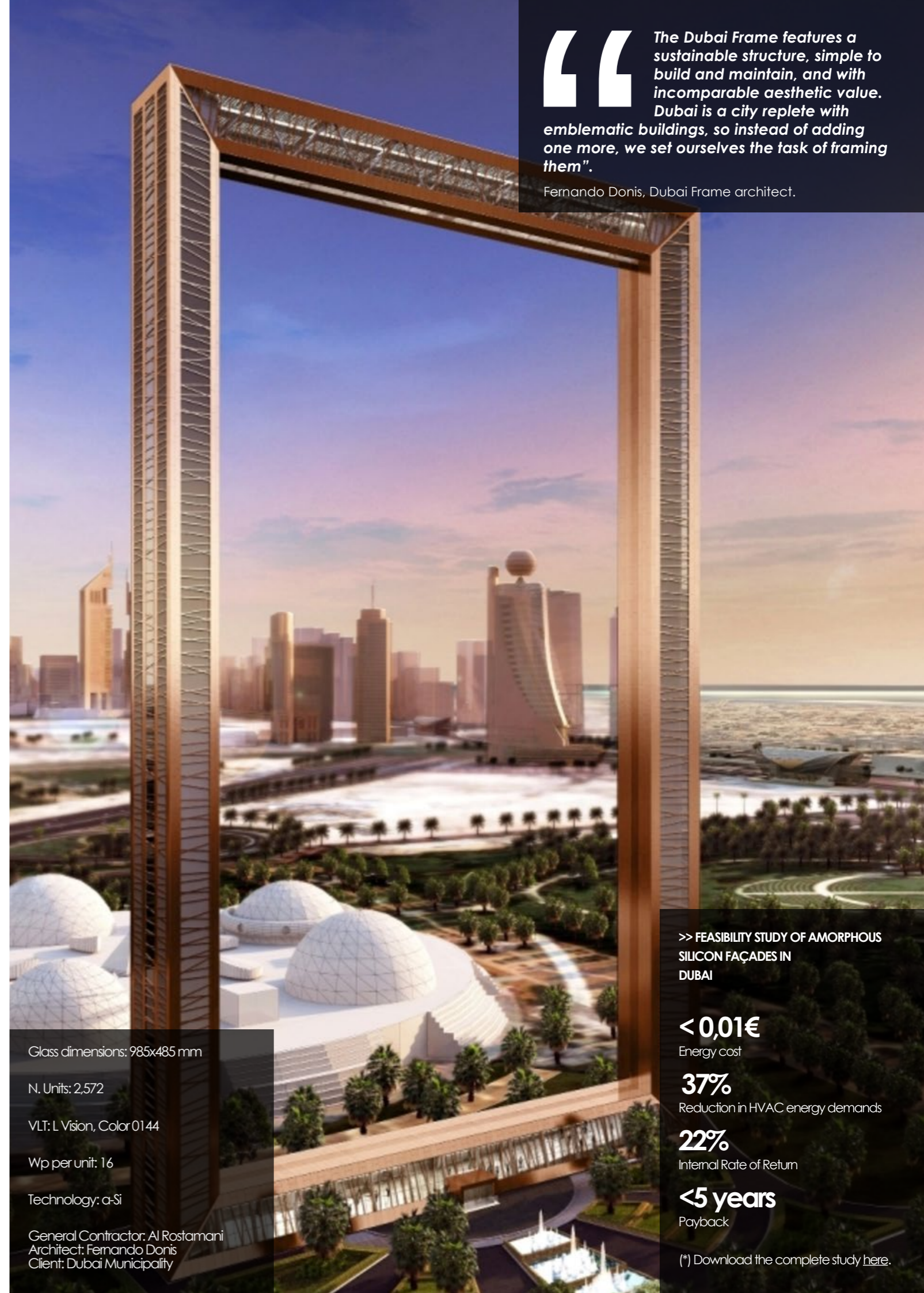


Onyx Solar® has developed a new generation of coloured semi-transparent photovoltaic glass, encompassing a wide spectrum of shades, while maintaining the same efficiency as colourless photovoltaic glass.

Dubai Frame - 1st prize, ThyssenKrupp Elevator Architecture Award 2009.

“ *The Dubai Frame features a sustainable structure, simple to build and maintain, and with incomparable aesthetic value. Dubai is a city replete with emblematic buildings, so instead of adding one more, we set ourselves the task of framing them”.*

Fernando Donis, Dubai Frame architect.



>> FEASIBILITY STUDY OF AMORPHOUS SILICON FAÇADES IN DUBAI

<0,01€
Energy cost

37%
Reduction in HVAC energy demands

22%
Internal Rate of Return

<5 years
Payback

(*) Download the complete study [here](#).

Glass dimensions: 985x485 mm

N. Units: 2,572

VLT: L Vision, Color 0144

Wp per unit: 16

Technology: a-Si

General Contractor: Al Rostamani
Architect: Fernando Donis
Client: Dubai Municipality

SCIENCE PYRAMID

HEXAGONAL PHOTOVOLTAIC GLASS



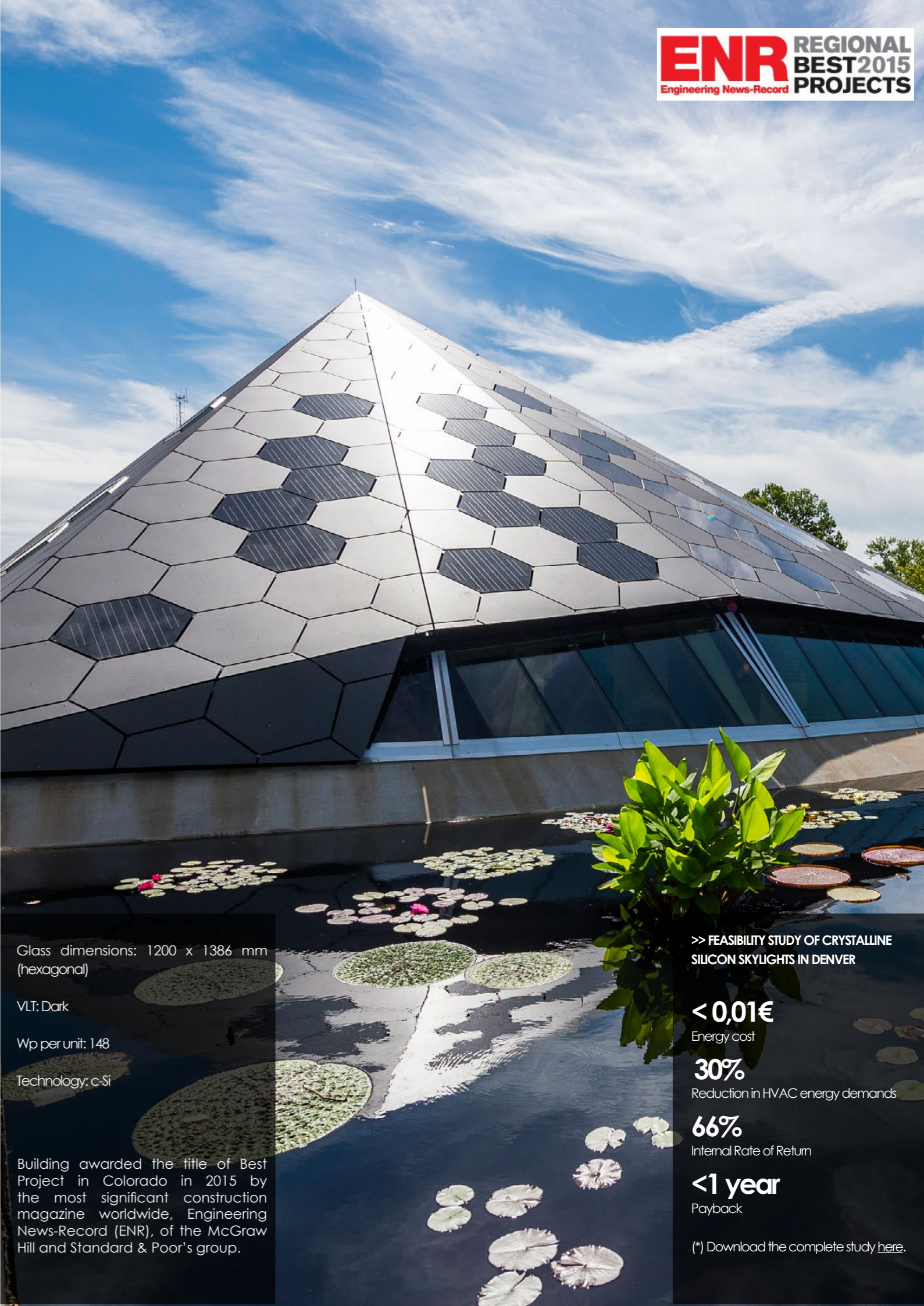
The Science Pyramid, located in the Denver Botanic Gardens, is a pyramid-shaped building. Here, Onyx Solar® has integrated **hexagonal crystalline silicon photovoltaic glass modules with a 100% custom-made design.**

This pyramid shows visitors the principal ecosystems of Colorado and explores similar environments around the world. The illumination and vibrations within the pyramid are determined by the current weather conditions.



“ It has been great to work with Onyx Solar®. It was the only company capable of making the hexagonal photovoltaic glass we needed and of helping us with the design”.

Adam Tormohlen, Project Manager at GH Phipps.



Glass dimensions: 1200 x 1386 mm (hexagonal)

VLT: Dark

Wp per unit: 148

Technology: c-Si

Building awarded the title of Best Project in Colorado in 2015 by the most significant construction magazine worldwide, Engineering News-Record (ENR), of the McGraw Hill and Standard & Poor's group.

>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN DENVER

< 0,01€

Energy cost

30%

Reduction in HVAC energy demands

66%

Internal Rate of Return

< 1 year

Payback

(*) Download the complete study [here](#).



Brian Vogt

Brian Vogt, CEO, Denver Botanic Gardens

"The pyramid's façade features photovoltaic glass, which generates clean, free energy from the sun. This is perfect for two of our fundamental values: sustainability and transformation. We wanted to include photovoltaic glass efficiently, and at the same time attractively, and the result has been absolutely amazing".

DIEGO CUEVAS

Diego Cuevas – Business Development VP at Onyx Solar®

"At Onyx Solar® we are fascinated by projects which represent a challenge. They give us the opportunity to design and manufacture unique photovoltaic glass items".

"The design and construction work executed have set these Botanic Gardens at the forefront of the most innovative gardens to visit in the country".



William P. Babbington

Will Babbington – AIA, PE | Façade Performance Design Director at Studio NYL

"The fascination and appeal of Onyx Solar®'s photovoltaic solutions is generally due to their ability to perform three main functions: - Environmental resistance; they can withstand damp and UV rays; - Renewable energy / Energetic balance, the key goal for using photovoltaic technology in buildings; - Aesthetics; the façade is the face, the appearance, and the eyes of the building's soul".

Barton Harris

Barton Harris, Project Manager at Burkett Design

"So as to completely integrate the photovoltaic modules in the aesthetics of the ventilated façade, not only was the colour of the glass carefully chosen to match the colour of the surrounding modules, but its surface was coated with a similar sheen".



MIAMI HEAT STADIUM

PHOTOVOLTAIC SKYLIGHT

SKANSKA



General Contractor: Skanska
 Architect: DLR Group
 Client: NRG

>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN MIAMI

<0,01€
Energy cost

44%
Reduction in HVAC energy demands

77%
Internal Rate of Return

<1 year
Payback

(*) Download the complete study [here](#).



“The HEAT group is proud to be a leader in the sustainability movement, both in our industry and in our beloved city”.

Eric Woolworth, HEAT Group Business Operations President

“Achieving the LEED Gold is a fantastic climax to our efforts over the last five years to act in an environmentally responsible manner, which has a positive effect on our community and on our planet”, Eric adds.

At the entrance to the **NBA Miami Heat stadium**, also known as the “American Airlines Arena”, **several circular skylights** may be seen, bearing the stamp of Onyx Solar®.

To complete the many circular skylights, approximately **300 crystalline silicon photovoltaic glass units**, made entirely to measure for the occasion, were used. These modules enable the stadium to generate **34,500 kWh** yearly, to be used for the building's self-consumption, leading to the prevention of the release of **20 tons of CO₂** into the atmosphere. Onyx Solar®'s technology has contributed to this stadium being **the first sports and entertainment centre to obtain the LEED Gold recertification**.



UP TO 6 LEED POINTS FOR IN-HOUSE RENEWABLE ENERGY GENERATION

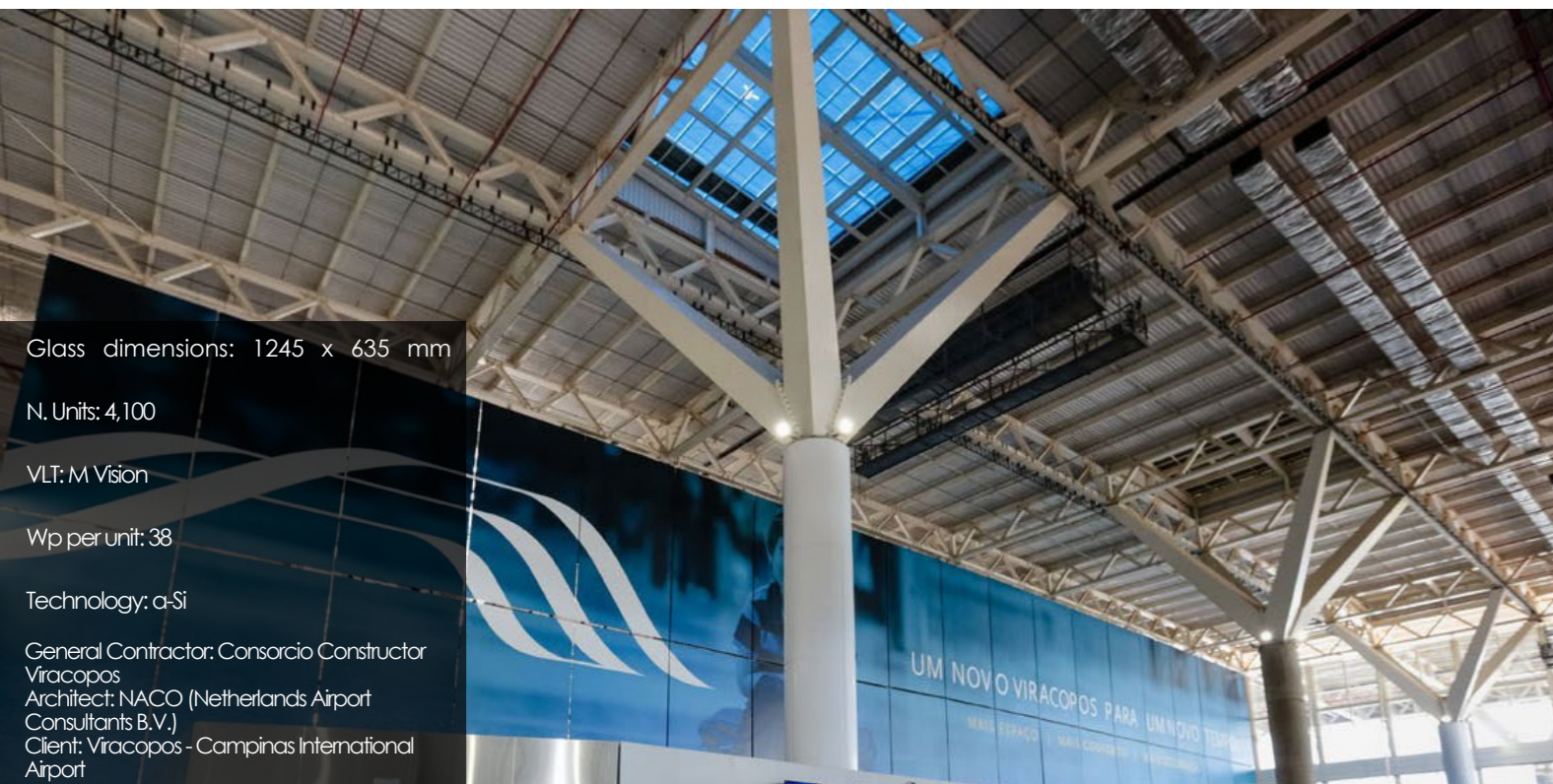
In order to reduce the environmental and economic impact associated with the use of fossil fuels, the LEED certification system offers up to 6 points for the in-house generation of 12% of renewable energy.

On-site renewable energy generation	Points
3%	1
4,5%	2
6%	3
7,5%	4
9%	5
12%	6



SÃO PAULO-VIRACOPOS AIRPORT

PHOTOVOLTAIC SKYLIGHT



Glass dimensions: 1245 x 635 mm

N. Units: 4,100

VLT: M Vision

Wp per unit: 38

Technology: a-Si

General Contractor: Consorcio Constructor Viracopos
 Architect: NACO (Netherlands Airport Consultants B.V.)
 Client: Viracopos - Campinas International Airport

The new terminal at Viracopos-Campinas International Airport features 33 amorphous silicon photovoltaic skylights integrated in the roof. The **4,100 photovoltaic glass units** employed form a surface area of over **3,340 m²** and a total installed power capacity of **154 kWp**, which will enable the generation of sufficient energy from the sun to feed approximately **10,200 lights** cleanly and without cost, preventing the release of nearly 120 tons of CO₂ into the atmosphere each year.

Low-e Photovoltaic Glass

Onyx Solar® has developed the first low-e photovoltaic glass on the market. A glass which has been rewarded by the American Glass Association as **the best glass in 2015**.

This glass, in addition to generating clean, free energy from the sun, is capable of **filtering out 99% of ultraviolet radiation** and **up to 95% of infrared radiation** while permitting the entry of daylight. These properties make this glass the ideal candidate when

designing a building with high standards of energy efficiency and thermal comfort.

This is a glass with a **g value (SHGC) of between 5% and 40%**, depending on its degree of transparency, which prevents the interior temperature from rising too high due to the greenhouse effect, particularly in locations with a hot climate, such as Sao Paulo.

All the above caused **NACO**, a company at the forefront of airport design, to choose Onyx Solar®'s low-e photovoltaic glass.

"Our mission is to contribute to the sustainable development of the airport. We are committed to the development of sustainable solutions for a wide range of airport-related matters and we work ceaselessly to sharpen our sustainable, innovative approach". NACO

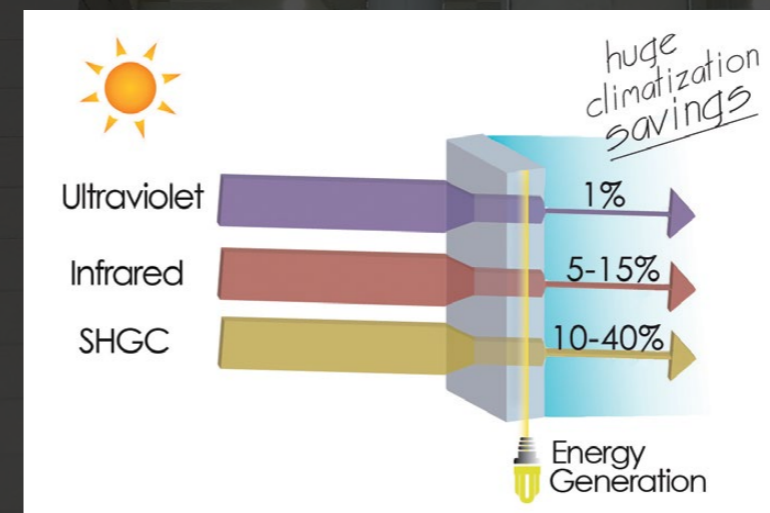
ONYX SOLAR®



glass magazine award winner 2015 MOST INNOVATIVE GLASS

TOTAL AREA	3.331 M2
ELECTRICITY GENERATED PER YEAR	178.690 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	10.182 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	119.718 CO2
BARRELS OF OIL SAVED PER YEAR	108 Barrels

OPTICAL PROPERTIES OF ONYX SOLAR®'S GLASS



>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHT IN SAO PAULO

- < 0,01€** Energy cost
- 49%** Reduction in HVAC energy demands
- 58%** Internal Rate of Return
- < 2 years** Payback

(*) Download the complete study [here](#).

AZURMENDI RESTAURANT

PHOTOVOLTAIC SKYLIGHT AND CURTAIN WALL



The Azurmendi Restaurant has not only obtained the **LEED Gold** certification but was also declared the **Most Sustainable Restaurant in the World in 2014**.

The project, with over 200 m² of photovoltaic glass integrated in the curtain wall and skylight, is considered to be one of the most outstanding photovoltaic integration solutions in the whole of Europe.

The **low-emissivity (or low-e) glass** used is made of amorphous silicon and features a **semi-transparency degree of 20% (L vision)**. This type of glass enables the passage of daylight into the interior while it filters out as much as **99% of the ultraviolet radiation and 95% of infrared light**, thus preventing harm to the interior furniture, to persons or to plants, and the greenhouse effect which is so common in glass-covered buildings.

The skylight and the curtain wall total an installed power capacity of **21 kWp** and generate approximately **16,500 kWh** per year, while preventing the release of **11 tons of CO₂** into the atmosphere.

Located in the Biscayan town of Larrabetzu, this restaurant with **three Michelin stars** and headed by Eneko Atxa, has won, in only two years, the 19th place in the ranking of "The World's 50 Best Restaurants".



“ **Most Sustainable Restaurant in the World in 2014.** ”



TOTAL AREA	270 M2
ELECTRICITY GENERATED PER YEAR	16.380 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	933 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	10.974 CO ₂
BARRELS OF OIL SAVED PER YEAR	10 Barrels

>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN BISCAY
< 0,02€
 Energy cost
34%
 Reduction in HVAC energy demands
55%
 Internal Rate of Return
<5 years
 Payback
 (*) Download the complete study [here](#).

Glass dimensions: 1628 x 1245 mm, 2653 x 1245 mm
 N. Units: 123
 VLT: L Vision
 Wp per unit: 90, 120.
 Technology: a-Si
 General Contractor: PROIEK
 Architect: Naia Eguino
 Client: Azurmendi Restaurant

ING DIRECT BANK

PHOTOVOLTAIC SKYLIGHT



Glass dimensions: 2560x1176 mm, 2560x576 mm, 2460x1176 mm, 2460x576 mm

N. Units: 78

VLT: L Vision

Wp per unit: 114, 56, 110, 54

Technology: a-Si

Architect: SP Arquitectura
Client: ING Direct

ING, the largest online bank in the world, pledged their commitment to Onyx Solar®'s technology with the integration of a photovoltaic glass skylight in the central garden of their headquarters in Las Rozas, Madrid.

The skylight, with a surface area of over **200 m²**, is comprised of **78** amorphous silicon glass modules with a **semi-transparency degree of 20% (L vision)** and dimensions of **2,560 x 1,176 mm**.

This skylight has a power capacity of **7 kWp** and is capable of generating nearly **13,000 kWh** of clean, free energy yearly, thus preventing the release of almost **9 tons** of CO₂ into the atmosphere while supplying over **700 lights** throughout the building.

In addition to generating power, the glass modules employed filter up to **99% of ultraviolet radiation and 95% of infrared light**. These modules also have an **optimal Solar Factor** which enables the entry of daylight while preventing the greenhouse effect, enhancing considerably the comfort of its occupants. The g value is between **20% and 40%**, depending on the degree of semi-transparency.

>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN MADRID

< 0,02€

Energy cost

34%

Reduction in HVAC energy demands

55%

Internal Rate of Return

< 2 years

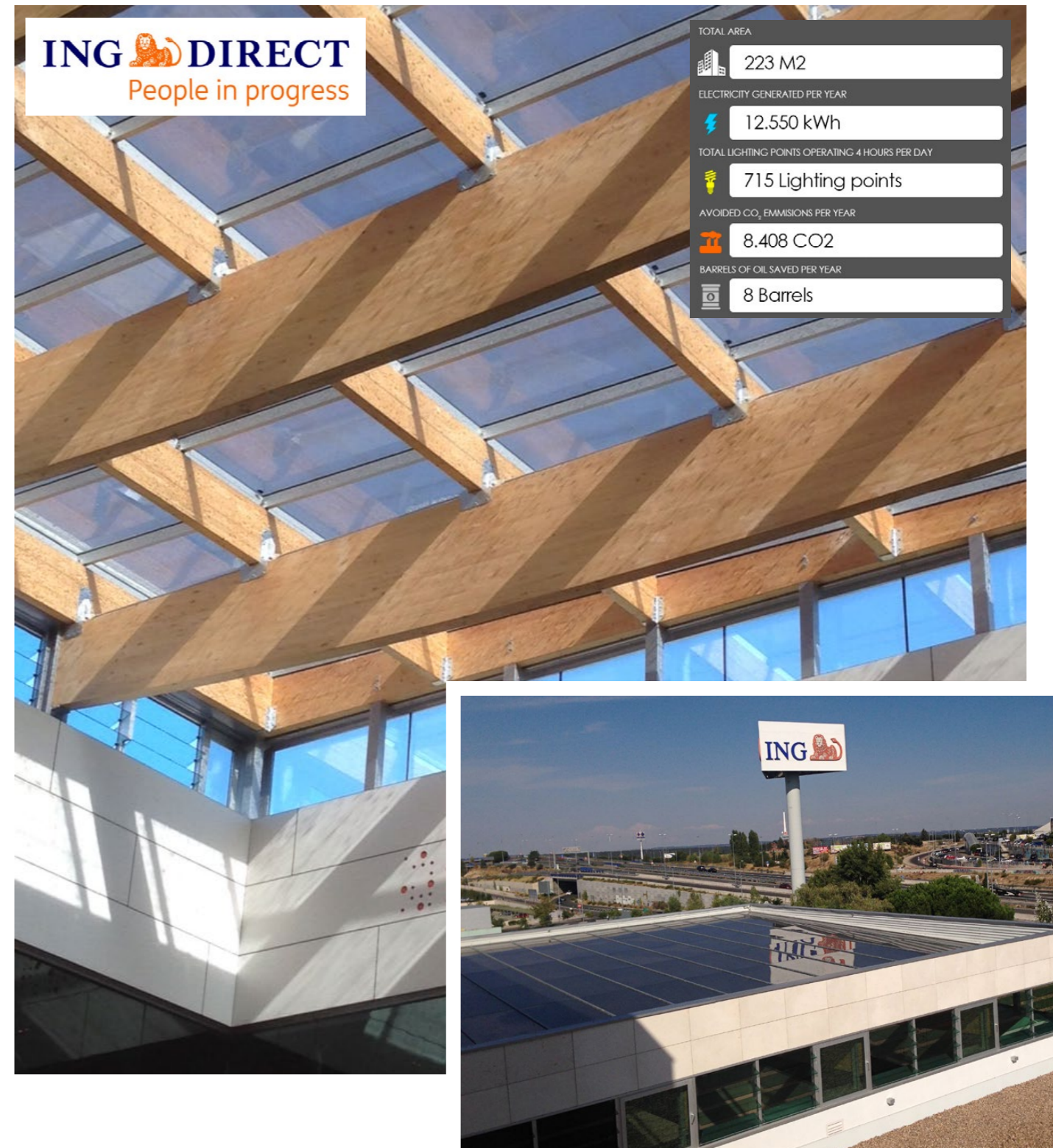
Payback

(*) Download the complete study [here](#).



With the photovoltaic glass modules in the skylight, we managed to exploit all the energetic potential of this area, while providing our garden with a pleasant atmosphere".
"In this way, this area represents a further example of our commitment to the environment; we achieve considerable energy savings, we use resources responsibly, we promote sustainable architecture and we gain a different, innovative workplace".

Juan Carlos Castillo, ING Bank General Services and Security Director.



LE PETIT ÉCHO DE LA MODE

PHOTOVOLTAIC SKYLIGHT

Onyx Solar® has taken part in the refurbishment of the historic building Le Petit Écho de la Mode in cooperation with SPIE, a French company devoted to the design, construction, operation and maintenance of energy facilities.

Located in the picturesque town of Châtelaudren, in Brittany (France), the building **preserves the spirit of Eiffel with its metal structure, and is considered to be a national heritage.** The refurbishment of this building, a Tourism Development

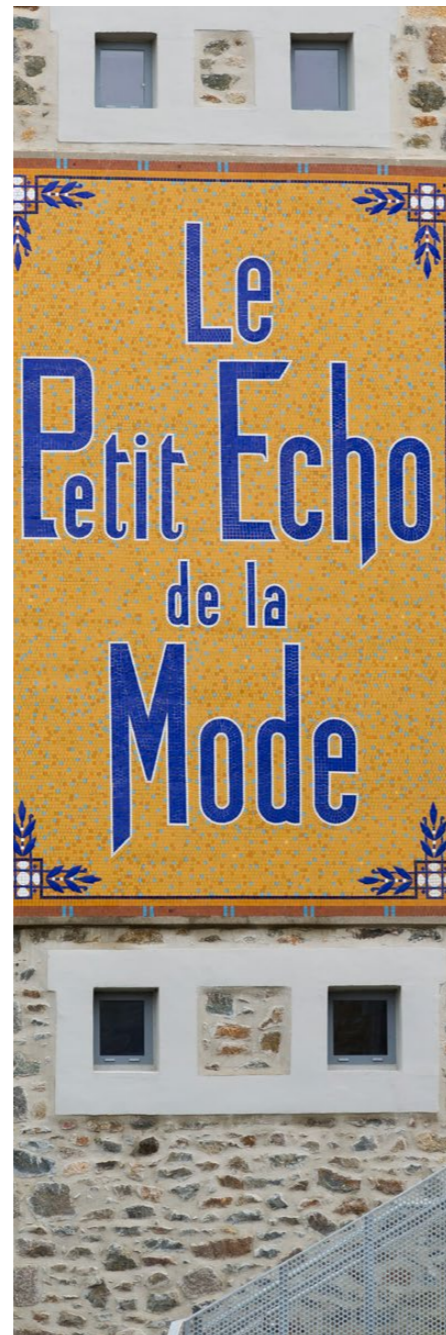
and Culture Centre of the locality, has followed a sustainable approach.

A photovoltaic skylight, comprised of low-emissivity (or low-e) glass with a **semi-transparency degree of 10% (M vision)**, enables this facility to generate over **42 kWh** per square metre per year. This solution enables the entry of daylight and improves energetic efficiency, while reducing the Culture Centre's electricity bill and HVAC energy demands.



The old Le Petit Écho de la Mode printing house

Le Petit Écho de la Mode was a famous women's fashion magazine which for decades printed over a million copies per week. It had as many as 200 employees working in the printing process and in the manufacture of sewing patterns until it closed in 1983.



TOTAL AREA	77 M2
ELECTRICITY GENERATED PER YEAR	4.884 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	278 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	3.272 CO2
BARRELS OF OIL SAVED PER YEAR	3 Barrels

>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN MARSEILLE

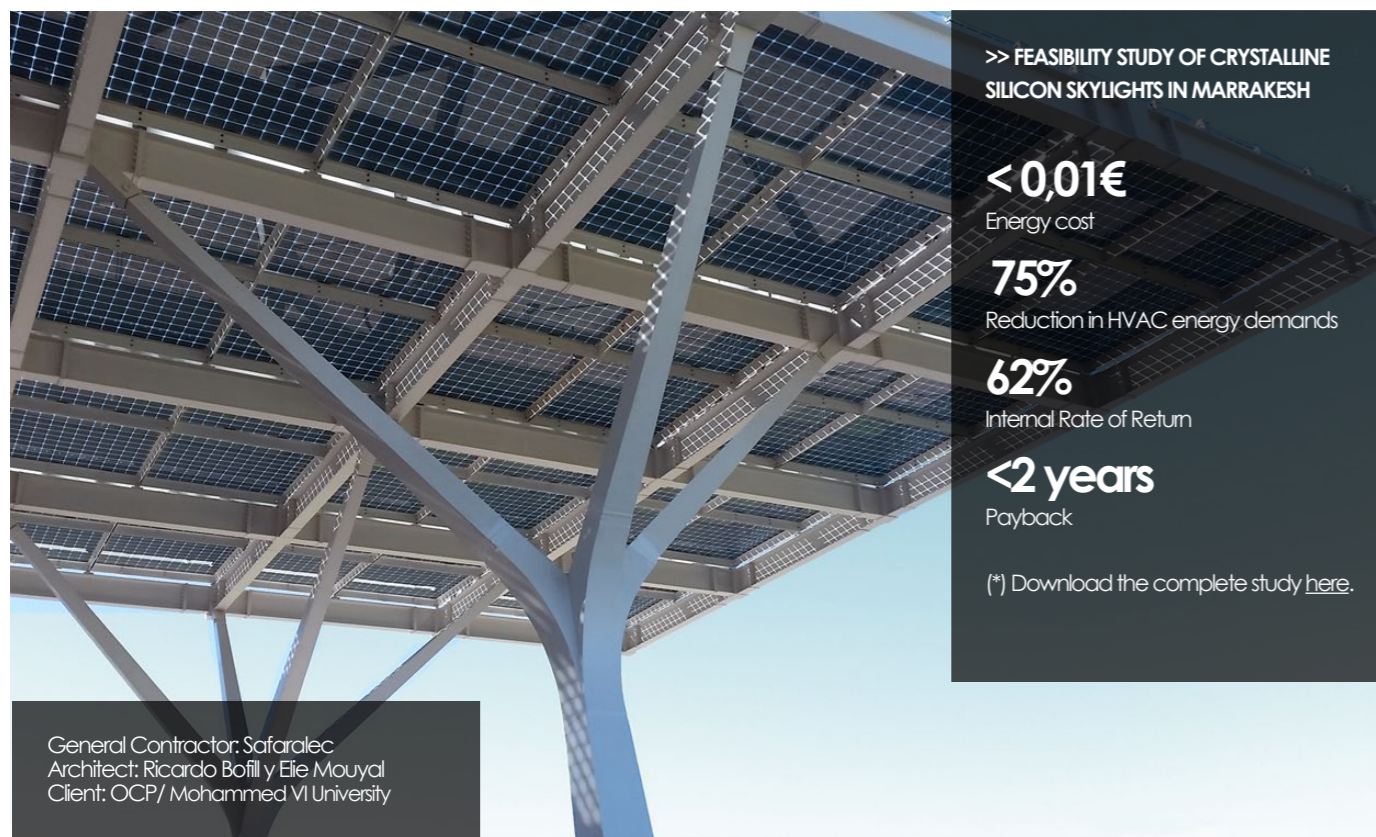
- < 0,02€ Energy cost
- 33% Reduction in HVAC energy demands
- 41% Internal Rate of Return
- < 3 years Payback

(*) Download the complete study [here](#).

General Contractor: SPIE
Client: Le Ieff communauté

MOHAMMED VI UNIVERSITY

PHOTOVOLTAIC CANOPY



>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN MARRAKESH

<0,01€

Energy cost

75%

Reduction in HVAC energy demands

62%

Internal Rate of Return

<2 years

Payback

(*) Download the complete study [here](#).

General Contractor: Safaralec
Architect: Ricardo Bofill y Elie Mouyal
Client: OCP/ Mohammed VI University

This photovoltaic pergola of nearly **600 m²** was installed at the entrance to the Mohammed VI Polytechnic University. The pergola endows the complex with an area where users may walk between buildings while enjoying a pleasant, refreshing shade, this being necessary in locations such as Morocco where high temperatures are reached and people are exposed to solar radiation.

For Onyx Solar®, this project entailed a challenge and an important record due to the high efficiency of the glass modules manufactured from crystalline silicon. These modules are of a large size and were designed especially to satisfy the client's needs. It is of particular note that a single module contains **144 photovoltaic cells** and achieves a power capacity of **626 Wp**, that is, **160 Wp per m²**, enabling the pergola to generate **135,000 kWh** and to prevent the release of almost **100 tons of CO₂** into the atmosphere each year.

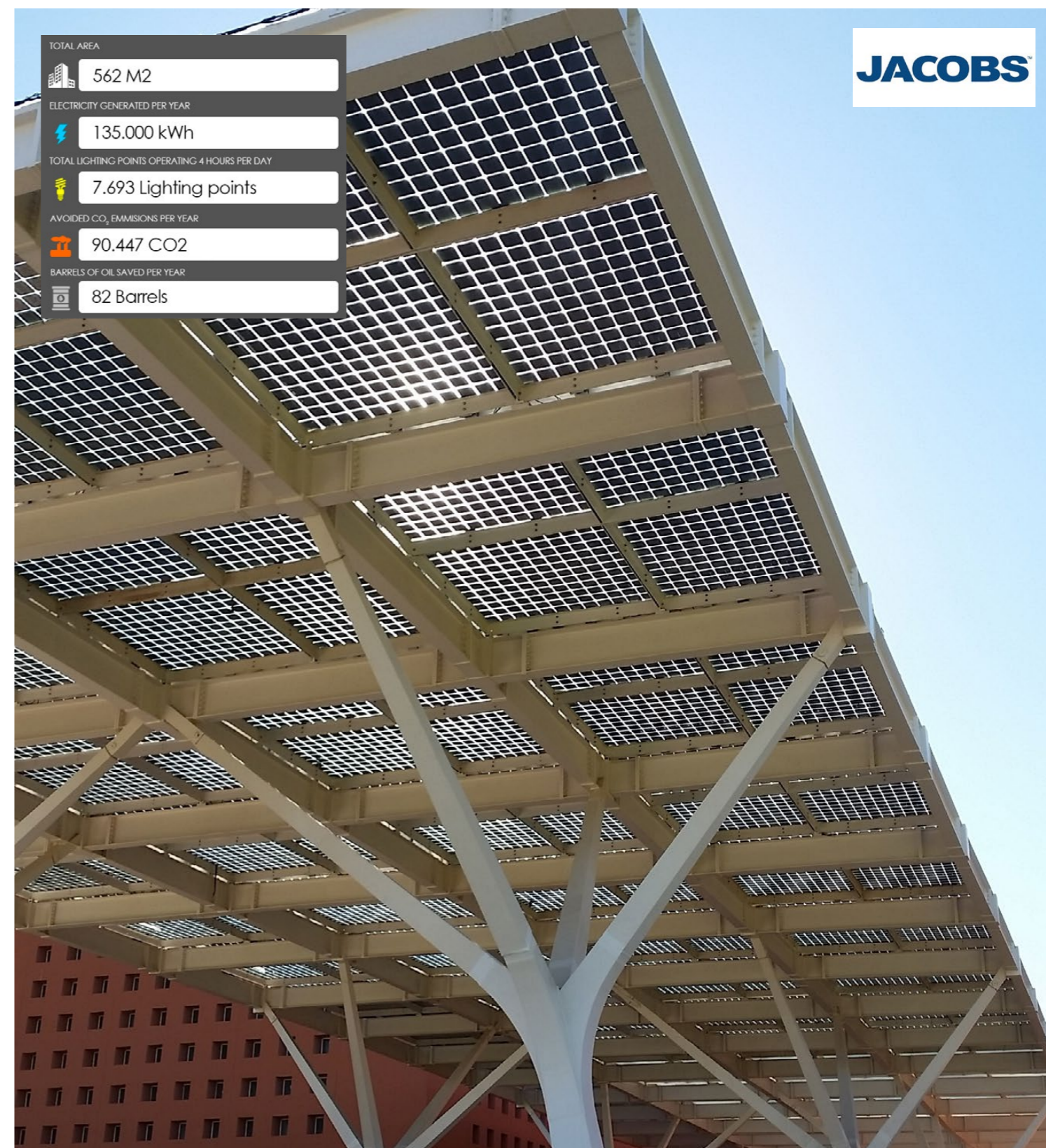
This project was penned by two architects of worldwide renown, **Ricardo Bofill** and Elie Mouyal, who preserved the spirit of Arab latticework in their design. **Jacobs**, a world leader in the provision of engineering and construction services, was entrusted with the construction of the pergola.

The Mohammed VI Polytechnic University is located at half an hour's distance from Marrakesh. This initiative was Onyx Solar®'s first project in Morocco and is included in the "Green Cities" development plan by the Moroccan state group OCP, the largest phosphate exporter worldwide. The new city has a surface area of 1,000 hectares and features a ratio of 20 m² of greenspace per capita.



The exploitation of daylight by means of glass modules such as those of Onyx Solar® enables the illumination of the various public areas, creating a subtle light favouring savings in energy consumption" "We undertake our works taking energetic efficiency and sustainability very seriously".

Ricardo Bofill.



TOTAL AREA	562 M2
ELECTRICITY GENERATED PER YEAR	135.000 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	7.693 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	90.447 CO ₂
BARRELS OF OIL SAVED PER YEAR	82 Barrels

JACOBS

CONIL TOWN HALL

PHOTOVOLTAIC SKYLIGHT

TOTAL AREA
92 M2

ELECTRICITY GENERATED PER YEAR
19.043 kWh

TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY
1.085 Lighting points

AVOIDED CO₂ EMISSIONS PER YEAR
12.758 CO₂

BARRELS OF OIL SAVED PER YEAR
12 Barrels

>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN ANDALUSIA

< 0,02€
Energy cost

62%
Reduction in HVAC energy demands

93%
Internal Rate of Return

< 2 years
Payback

(*) Download the complete study [here](#).

Glass dimensions: 1610x1196 mm

VLt: 25%

Wp per unit: 253

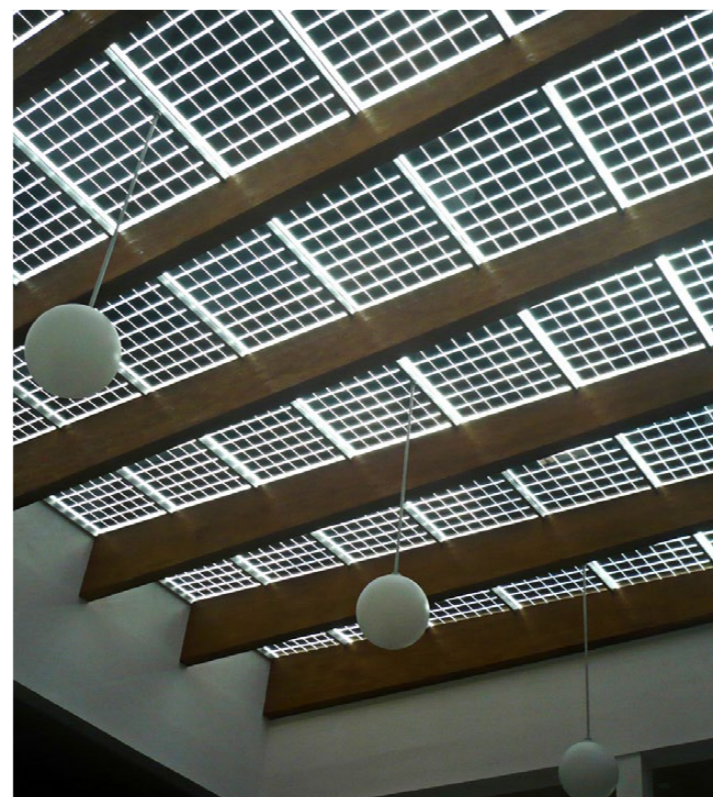
Technology: Si-poly

General Contractor: DANIANA
Client: Conil Town Council

This photovoltaic skylight, executed by Onyx Solar® for the Town Hall of Conil, in Cadiz (Spain) has a surface area of **90 m²**.

For this project, a **low-e (low-emissivity) photovoltaic glass** was chosen, whose air chamber endows the building with a high degree of both thermal and acoustic insulation.

The glass, made of crystalline silicon, has a **semi-transparency degree of 25%**, which enables the entry of daylight into the building. The installed power capacity is **12.2 kWp** and it generates the **19,000 kWh** per year needed to supply 1,100 lights.



PRIVATE RESIDENCE

PHOTOVOLTAIC BACKYARD WALL

>> FEASIBILITY STUDY OF AMORPHOUS SILICON FAÇADES IN AVILA

< 0,02€
Energy cost

34%
Reduction in HVAC energy demands

55%
Internal Rate of Return

< 5 years
Payback

(*) Download the complete study [here](#).

Onyx Solar® has installed its first photovoltaic perimeter fence in a private residence located in Avila, Spain.

The glass employed is one of the greatest innovations. It is a **satin-finish anti-glare glass** which maintains its photovoltaic properties and at the same time diffuses the passage of the light, providing privacy and comfort for users.

This fence generates clean, free energy from the sun, reaching **425 kWh per year**, with a total peak installed power of **820 Wp**.



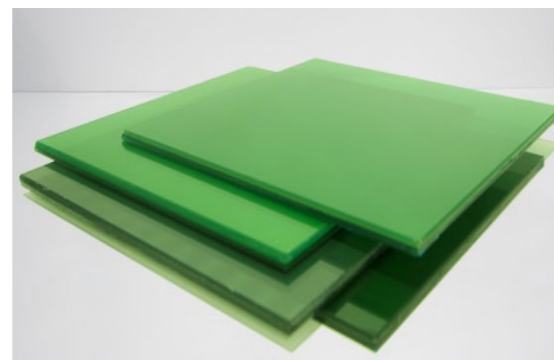
TERINA MEDITERRANEAN FOUNDATION

PHOTOVOLTAIC SOLUTION PACKAGE

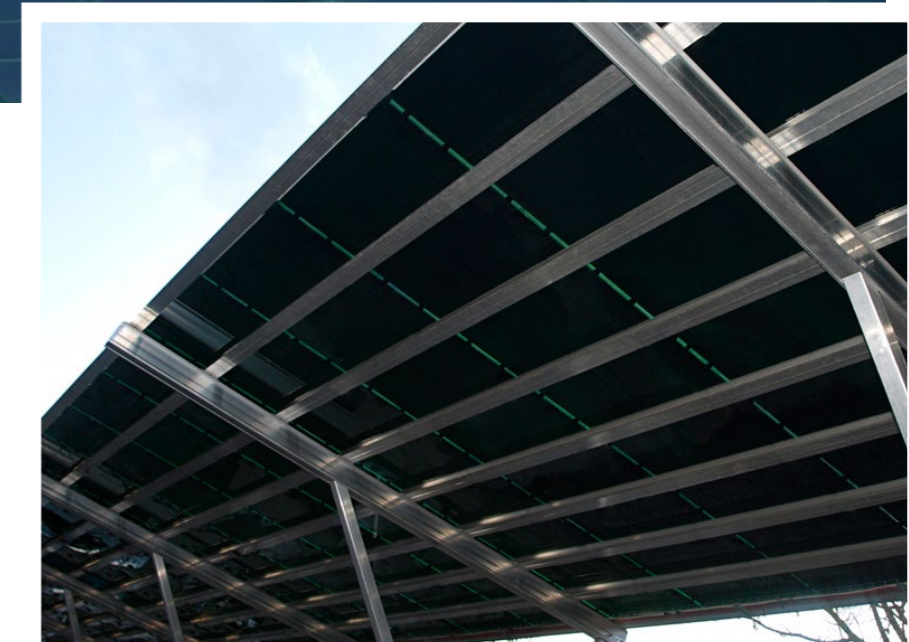


The refurbishment of the buildings of the Terina Mediterranean Foundation in Calabria (Italy) has a unique character and represents an important milestone for Onyx Solar®, as a single building complex houses **3,000 m²** of photovoltaic glass. The glass, made of **green amorphous silicon** and with various degrees of transparency, has been integrated in skylights, floors, walkway, parking lots and even in an elevator with panoramic views.

The Terina Mediterranean Foundation is a centre of excellence devoted, among other activities, to research and knowledge of the agro-food industry via a network of relationships with Italian and foreign universities.



The photovoltaic glass installed at Lamezia Terme is green in colour, one of the colours typical of this region.



“ The “Terina Mediterranean Foundation” research centre has entrusted Onyx Solar® with the refurbishment of its buildings, with an optimal integration of amorphous silicon photovoltaic glass with different degrees of transparency and shades of green.”

Juan Luis Lechón, Engineer at Onyx Solar®.

>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN PALERMO

< 0,02€
Energy cost

44%
Reduction in HVAC energy demands

81%
Internal Rate of Return

< 2 years
Payback

(*) Download the complete study [here](#).

CABINET HOUSE

PHOTOVOLTAIC SKYLIGHT AND FAÇADE

>> FEASIBILITY STUDY OF AMORPHOUS SILICON FAÇADES IN ROME

< 0,04€

Energy cost

29%

Reduction in HVAC energy demands

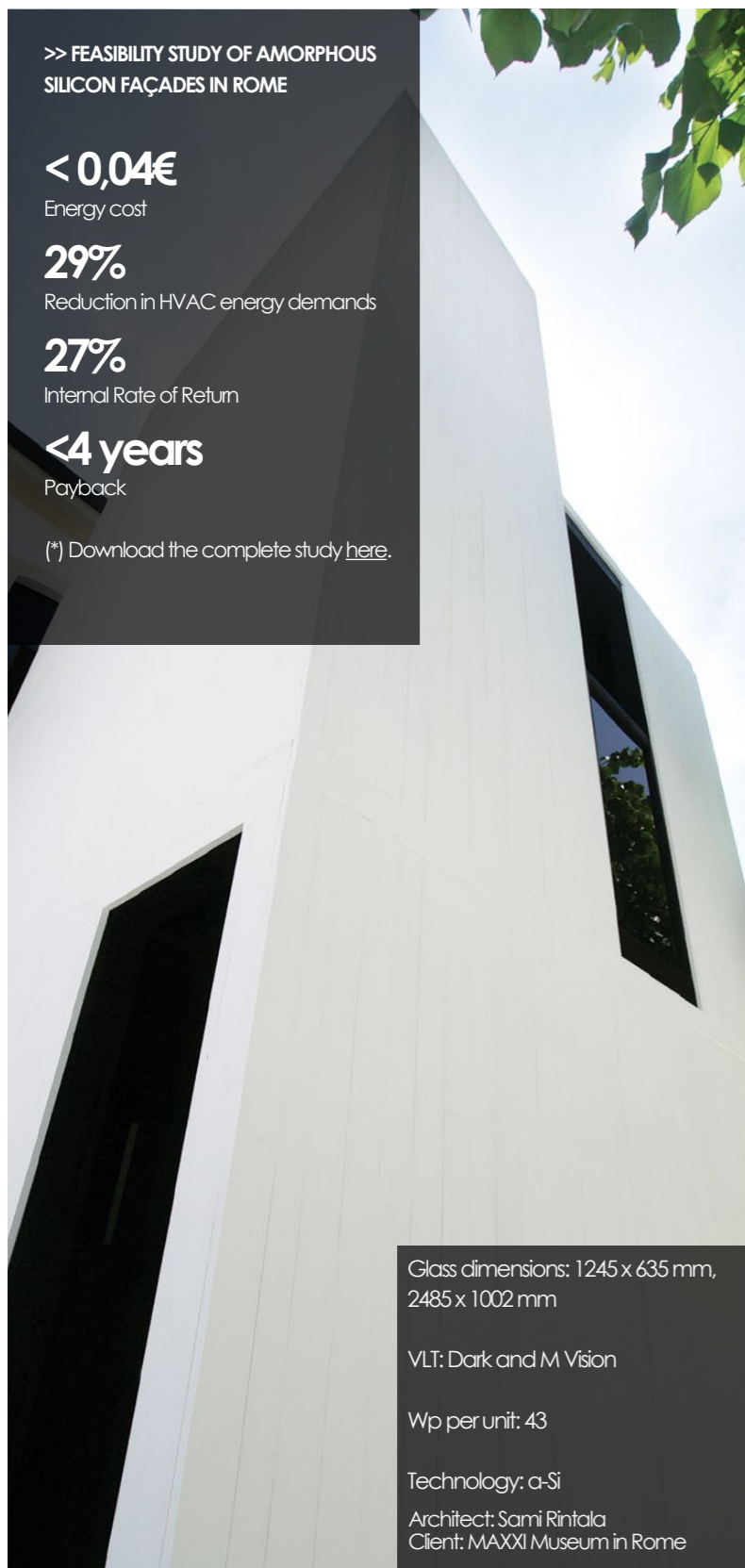
27%

Internal Rate of Return

<4 years

Payback

(*) Download the complete study [here](#).



Glass dimensions: 1245 x 635 mm, 2485 x 1002 mm

VLT: Dark and M Vision

Wp per unit: 43

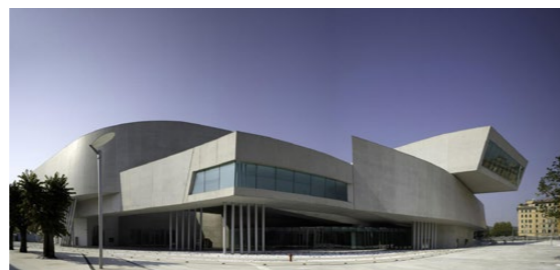
Technology: a-Si

Architect: Sami Rintala
Client: MAXXI Museum in Rome

Zaha Hadid Architects



The architect **Zaha Hadid** was the first woman to win the Pritzker Prize (2004). Among her projects, the Maxxi Museum in Rome or the BMW headquarters in Germany are of note.



Onyx Solar® designed and developed the photovoltaic skylight and façade for the **Cabinet House**, installed in the **MAAXI Museum in Rome**, one of the most emblematic creations of the Iraqi architect **Zaha Hadid**, and selected in **2010 as the best building in the world**.

The **Cabinet House** is a prototype of a sustainable residence based on a new form of dividing spaces, bearing in mind contemporary urban lifestyle. Both solutions are comprised of amorphous silicon glass and total an installed power capacity of **645 Wp**, generating approximately **900 kWh** of clean, sun-derived energy per year.

PANAMA PACIFICO

PHOTOVOLTAIC CANOPY



>> FEASIBILITY STUDY OF AMORPHOUS SILICON FULL ENVELOPES IN PANAMA

< 0,02€

Energy cost

80%

Reduction in HVAC energy demands

52%

Internal Rate of Return

<2 years

Payback

(*) Download the complete study [here](#).

Glass dimensions: 1245x1849 mm, 1024x1245 mm

VLT: M Vision

Technology: a-Si

General Contractor: London & Regional Properties
Client: Wakefield Beasley & Associates

London & Regional, one of the largest private real estate companies in Europe, is the developer of "Panama Pacific". This immense multi-use complex is a recreational, residential and business community located to the west of Panama, on the former Howard Air Base.

Onyx Solar®'s contribution to this project has been the construction of an amorphous silicon photovoltaic pergola for one of the buildings. The glass has a **semi-transparency degree of 10% (M vision)** and generates **7,300 kWh** yearly, with a total installed power capacity of **5.1 kWp**.

SOLAR DECATHLON SML HOUSE 2010

PHOTOVOLTAIC FAÇADE



1^{er} PREMIO VIABILIDAD DE MERCADO

sd europe SOLAR DECATHLON

TOTAL AREA
50 M2

ELECTRICITY GENERATED PER YEAR
1.188 kWh

TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY
68 Lighting points

AVOIDED CO₂ EMISSIONS PER YEAR
796 CO₂

BARRELS OF OIL SAVED PER YEAR
1 Barrel

Glass dimensions: 860 x 200 mm, 890 x 200 mm, 760 x 200 mm

N. Units: 270

VLT: Dark

Wp per unit: 10, 11

Technology: a-Si

Client: Cardenal Herrera University

The **European Solar Decathlon** is an international university competition to boost research into the development of energy-efficient residences. The goal of the teams taking part is the design and construction of houses which consume a minimum quantity of natural resources and produce minimal waste during their life cycle. Special emphasis is given to reducing energy consumption and obtaining all the energy required from the sun.

Originally created by the U.S. Department of Energy, it has had a European counterpart since 2010.



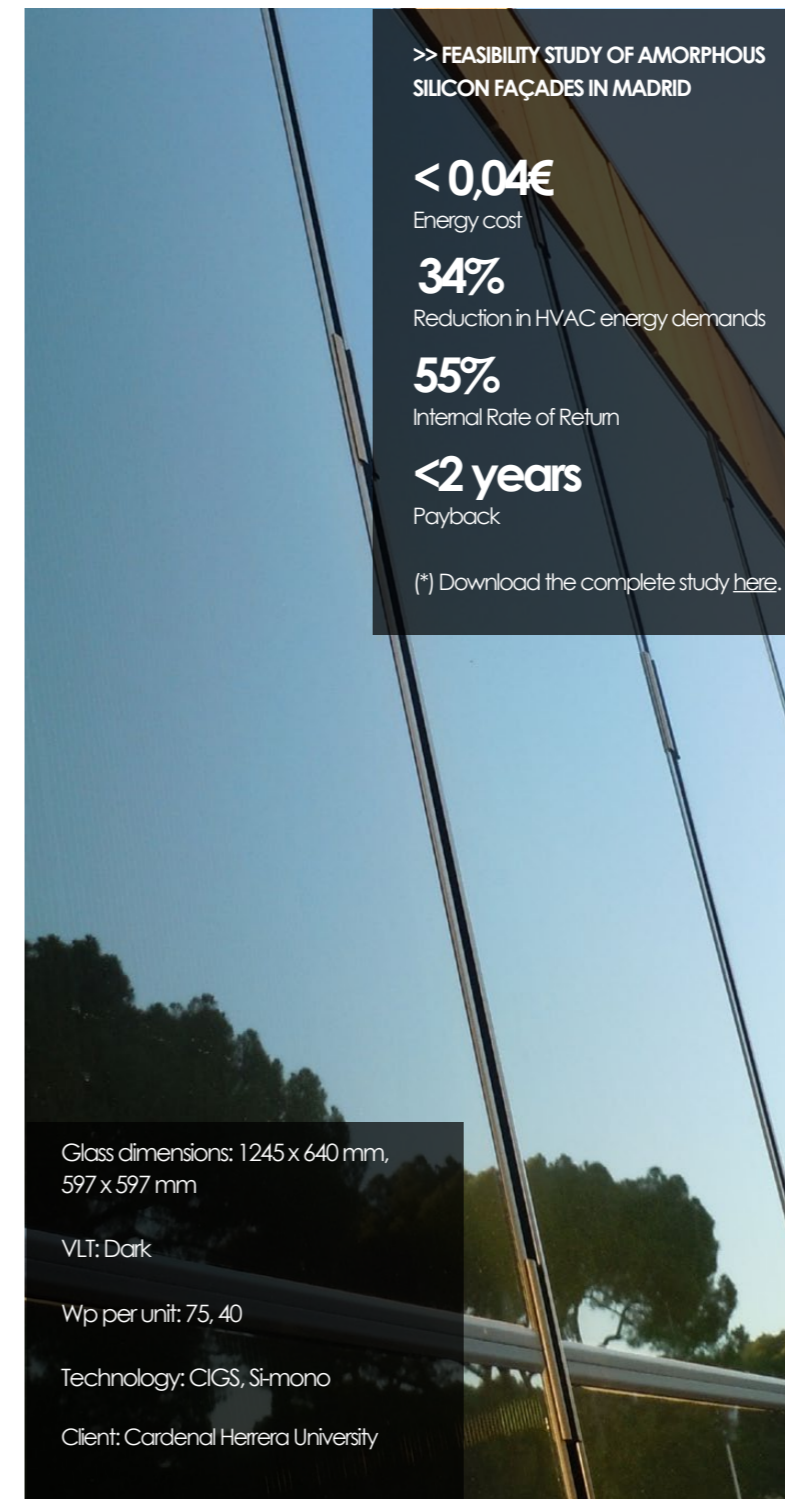
The **2010 SML House**, executed by the CEU Cardenal Herrera University, won **first prize in the Market Feasibility and Industrialisation category**.

Onyx Solar®'s participation in the project consisted of the integration of opaque amorphous silicon glass into the façade with a wooden lath substructure. The façade generates **nearly 1,200 kWh** of energy per year, sufficient to supply **70 lights** cleanly and free of cost, thanks to the sun.

This house, fed solely by solar energy, was the best rated of those presented by Spanish universities and was the most voted by the 190,000 visitors to the competition held in Madrid.

SOLAR DECATHLON SML HOUSE 2012

PHOTOVOLTAIC FAÇADE AND FLOOR



>> FEASIBILITY STUDY OF AMORPHOUS SILICON FAÇADES IN MADRID

< 0,04€
Energy cost

34%
Reduction in HVAC energy demands

55%
Internal Rate of Return

< 2 years
Payback

(*) Download the complete study [here](#).

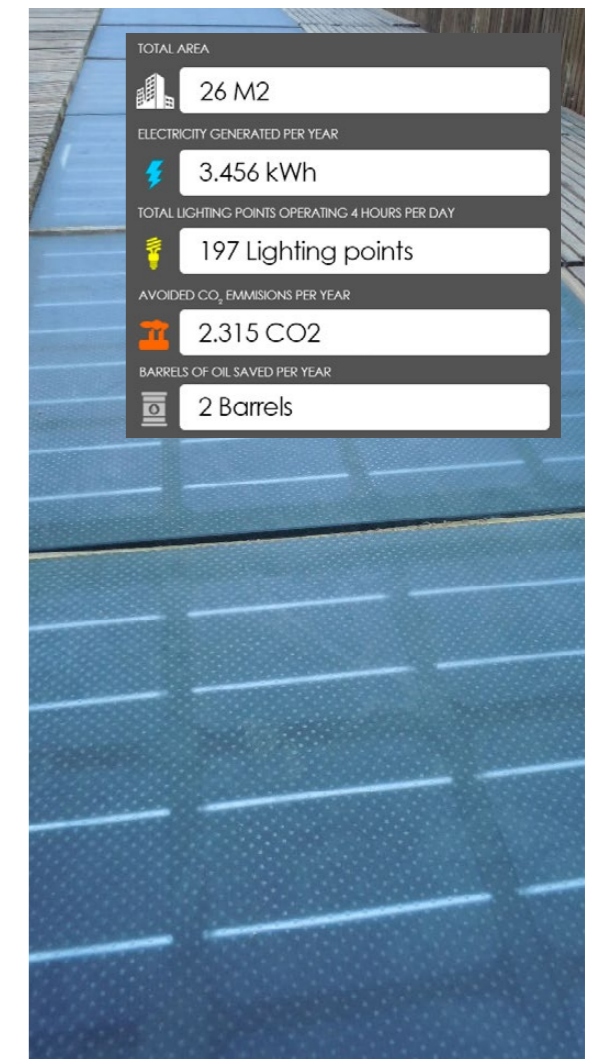
Glass dimensions: 1245 x 640 mm, 597 x 597 mm

VLT: Dark

Wp per unit: 75, 40

Technology: CIGS, Si-mono

Client: Cardenal Herrera University



TOTAL AREA
26 M2

ELECTRICITY GENERATED PER YEAR
3.456 kWh

TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY
197 Lighting points

AVOIDED CO₂ EMISSIONS PER YEAR
2.315 CO₂

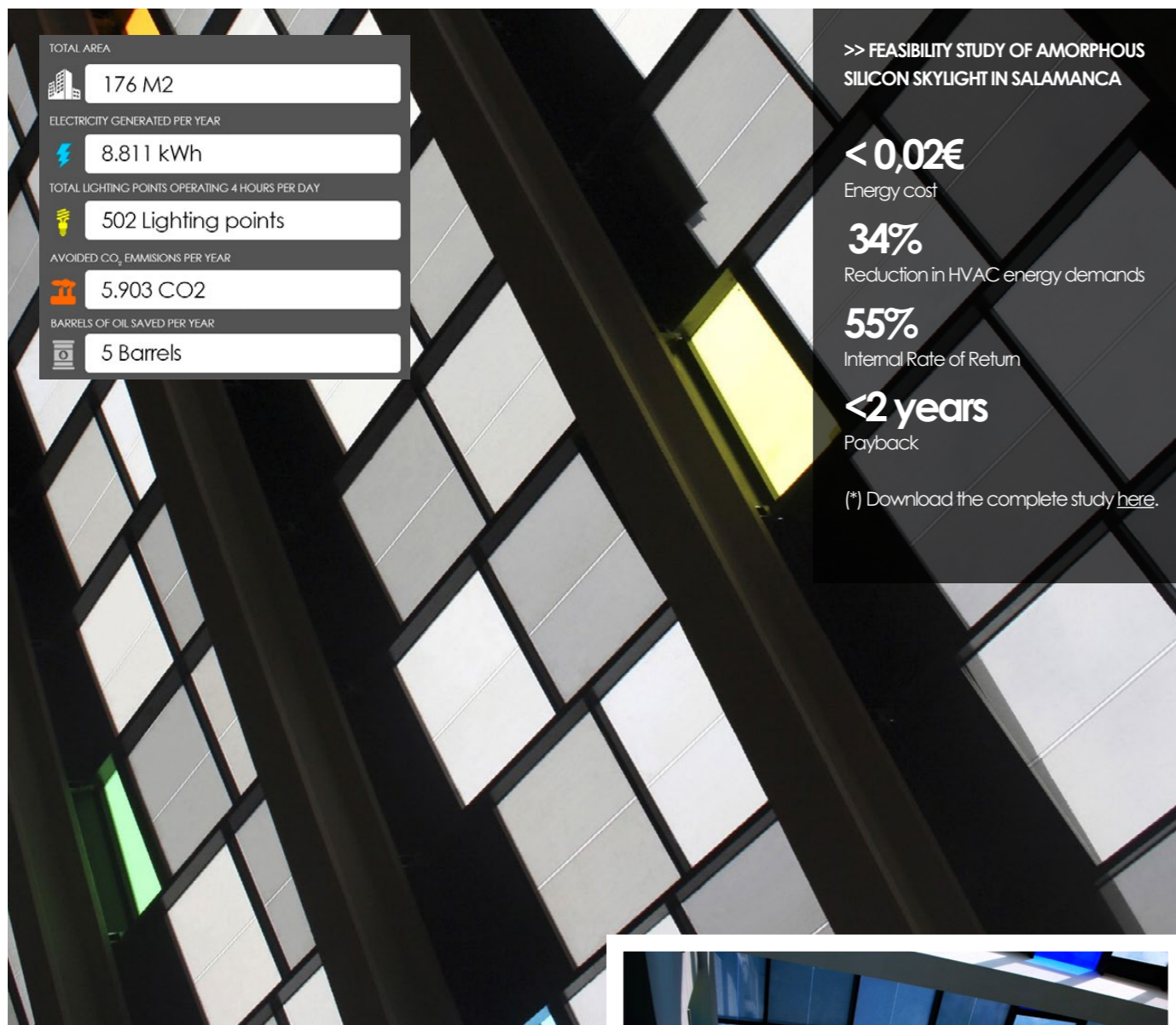
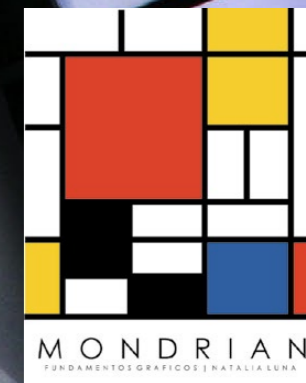
BARRELS OF OIL SAVED PER YEAR
2 Barrels

Onyx Solar® took part in the integration of the photovoltaic façade and floor for the **2012 SML System** solar house, designed by students and researchers of Architecture and Engineering at CEU University, who were awarded **second prize for Innovation**.

Opaque laminated double-glazing was used for the façade and floor, chosen in order to achieve a greater output, approximately **3,500 kWh** of energy generated per year.

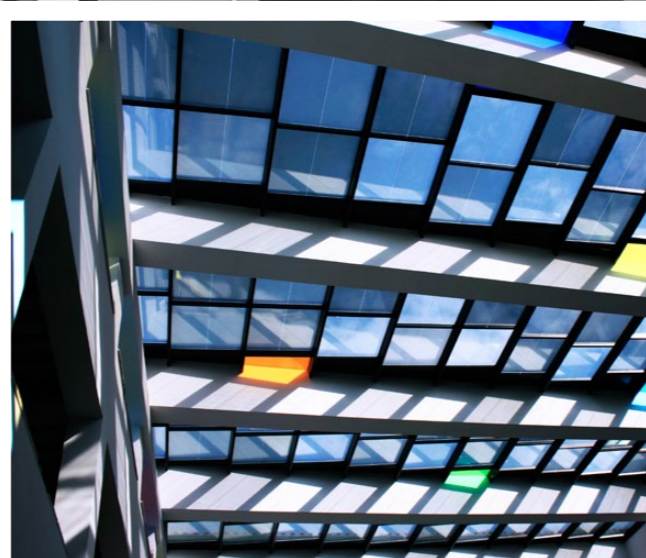
BEJAR MARKET

PHOTOVOLTAIC SKYLIGHT



Refurbishment of the historic Food Market of Bejar, Salamanca (Spain), with the installation of a **176 m²** photovoltaic skylight. This skylight combines amorphous silicon modules of varying degrees of transparency and colours which form a mosaic inspired by the neoplasticism of Piet Mondrian. Besides, due to an installed power capacity of **6.7 kWp** it can generate almost **9,000 kWh** of energy per year, and prevent the release of **6 tons of CO₂**.

Part of the power generated is sent to be stored in batteries, and the rest is sent to the grid for the building's own consumption.



Glass dimensions: 1245 x 1242 mm

N. Units: 110

VLT: M, L and XL Vision

Wp per unit: 65, 54, 46

Technology: a-Si

General Contractor: Tuconsa
Client: Bejar Town Council

SENIORS RESIDENCE

PHOTOVOLTAIC CANOPY

>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN MADRID

TOTAL AREA	69 M2
ELECTRICITY GENERATED PER YEAR	5.157 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	328 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	3.857 CO ₂
BARRELS OF OIL SAVED PER YEAR	3 Barrels

< 0,02€
Energy cost

34%
Reduction in HVAC energy demands

55%
Internal Rate of Return

<2 years
Payback

(*) Download the complete study [here](#).

General Contractor: Geocisa/
Dragados
Architect: QVE
Client: Coslada City Council

DRAGADOS

Installation of a photovoltaic pergola at the "Primavera" Seniors Residence in Coslada, Madrid.

The installation covers an area of **70 m²**, with 48 opaque amorphous silicon photovoltaic glass modules. This pergola generates over **5,000 kWh** yearly, preventing the release of **4 tons of CO₂** into the atmosphere per year. The installed power capacity is **4.3 kWp**.

THE BAMBOO HOUSE

PHOTOVOLTAIC SKYLIGHT

TOTAL AREA	33 M2
ELECTRICITY GENERATED PER YEAR	1.382 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	79 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	926 CO ₂
BARRELS OF OIL SAVED PER YEAR	1 Barrel

By installing Onyx Solar®'s photovoltaic glass in the envelope of a building in Shanghai, considerable energy savings may be achieved in HVAC energy demands; over 60% with crystalline silicon photovoltaic glass, and over 36% with amorphous silicon glass.

General Contractor: Madrid City Council
Architect: FOA
Client: Madrid City Council

During the 2010 Shanghai Expo, the Bamboo House was the headquarters of the Madrid pavilion. This building was given a **RIBA (Royal Institute of British Architects) European Award**. It was also awarded a prize for the **best urban practice in 2010** due to its revolutionary bioclimatic concept.

The house features a **low-e photovoltaic skylight** with a **semi-transparency degree of 20% (L vision)**. This glass, in addition to producing power, is capable of filtering out **99% of ultraviolet radiation** and up to **95% of infrared radiation** while enabling the entry of daylight.

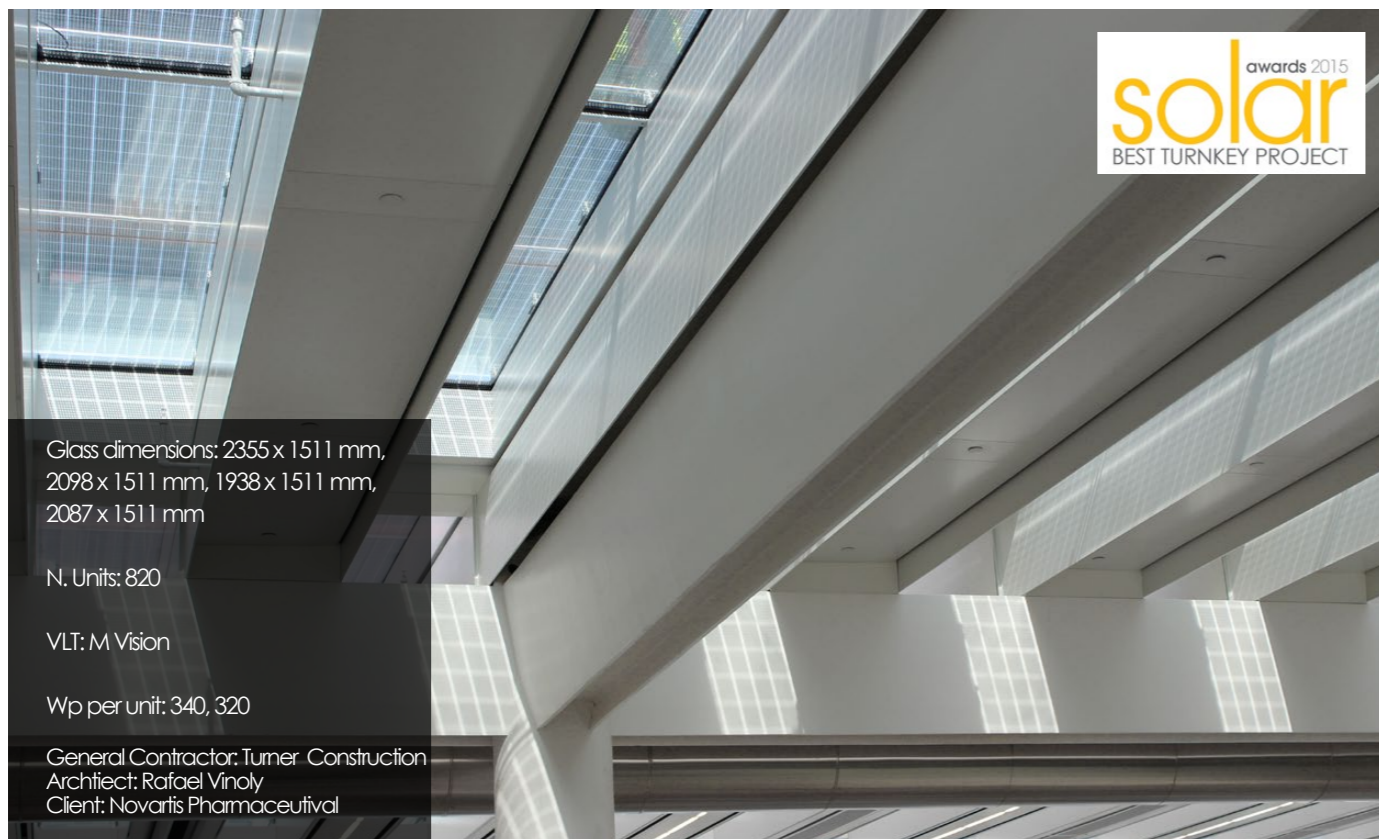
A glass with a **g value** of between **5% and 40%**, depending on the degree of semi-transparency selected, and which is optimal for the **prevention of the greenhouse effect** within the building, thus enhancing the comfort of the occupants. Thanks to the photovoltaic properties of the glass, this skylight generates **1,400 kWh** per year.

Alejandro Zaera, the architect who penned this project, is also the creator of projects such as the Yokohama International Port Terminal in Japan.



HEADQUARTERS OF NOVARTIS

PHOTOVOLTAIC SKYLIGHT



Glass dimensions: 2355 x 1511 mm, 2098 x 1511 mm, 1938 x 1511 mm, 2087 x 1511 mm

N. Units: 820

VLT: M Vision

Wp per unit: 340, 320

General Contractor: Turner Construction
 Architect: Rafael Vinoly
 Client: Novartis Pharmaceutical

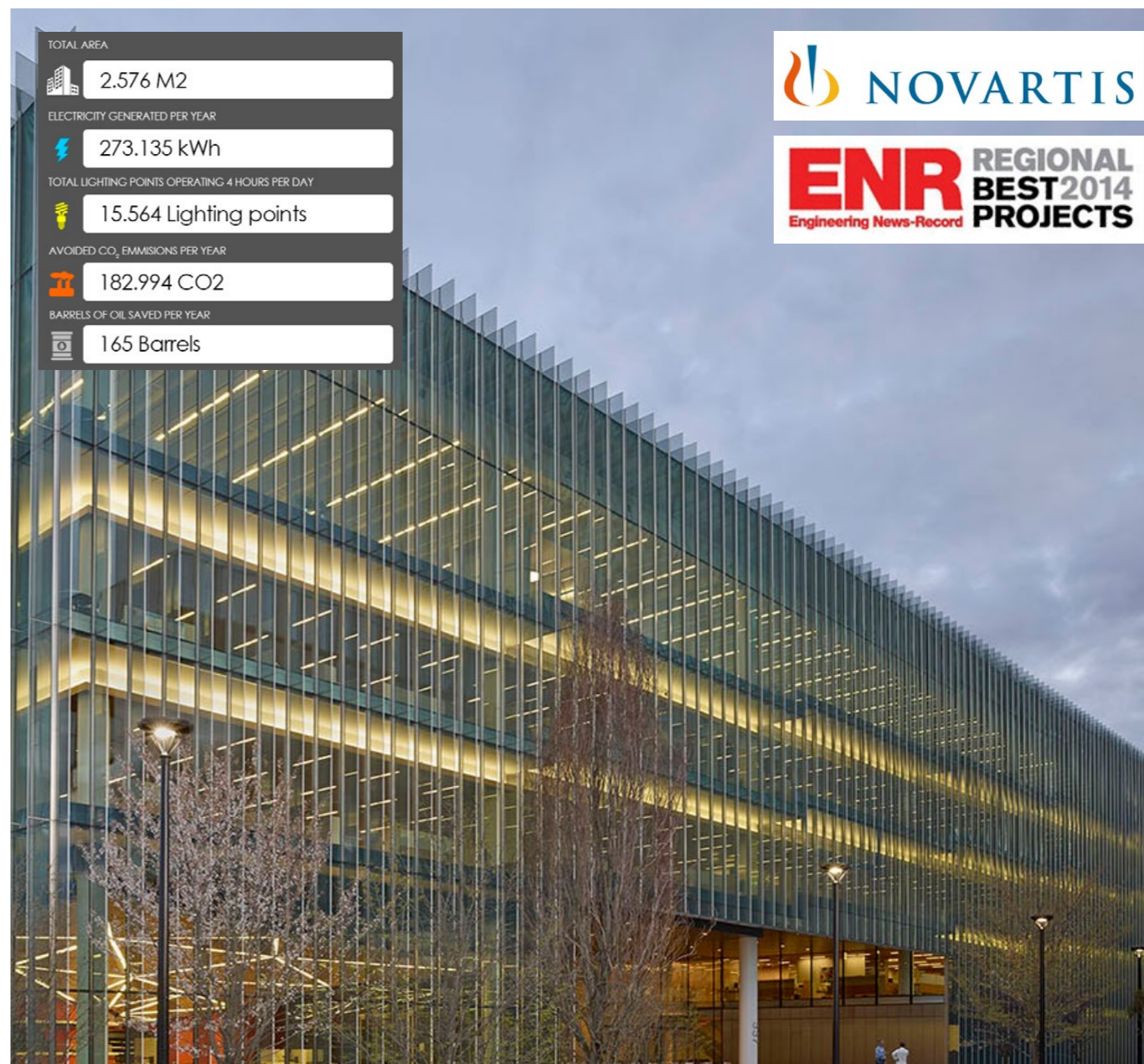
This innovative photovoltaic skylight, measuring **2,500 m²**, was installed by way of a second skin at the new headquarters of the **Novartis** Pharmaceutical Company in New Jersey, USA.

The skylight is comprised of **820** modules of photovoltaic glass measuring **1,511 x 1,931 mm**, with a power capacity of **340 Wp**. It was manufactured with **perforated crystalline** cells, which enable the passage of daylight. The design of the skylight enables the modules to be opened and closed, making the skylight totally operable.

The incorporation of this innovative technology enables the building to generate over **273,000 kWh** per year, equivalent to lighting over **600 homes** yearly, and entailing a reduction of nearly **185 tons of CO₂** released into the atmosphere, and avoiding the consumption of **165 barrels of oil per year**.

Novartis, with over 120,000 employees, is a worldwide referent due to its sustainable practices and occupies the leading position among pharmaceutical companies in the Dow Jones European and World Sustainability Indices.

The New Jersey campus promotes research, and is doubtless one of the greatest referents on an architectural level due to the efficiency of its buildings.



TOTAL AREA	2.576 M2
ELECTRICITY GENERATED PER YEAR	273.135 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	15.564 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	182.994 CO2
BARRELS OF OIL SAVED PER YEAR	165 Barrels



“ Building awarded the title of Best Sustainable Project in New York in 2014 by the most significant construction magazine worldwide, Engineering News-Record (ENR), of the McGraw Hill and Standard & Poor’s group”.

Turner: construction, leadership and safety.

The influential magazine Engineering News Record (ENR) has once again awarded the U.S. company Turner Construction first place in the ranking of American general contractors due to its sales volume within the country.

In addition to the excellence of its work, Turner stands out due to its commitment to safety, having received the award for excellence in this field.

“The role played by Turner throughout the project has been decisive for its success, ensuring high-quality work, coordinating the many teams and being at the forefront of communications between all the parties”, says Teodosio del Caño, Chief Technical Officer of Onyx Solar®.



>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN NEW YORK

< 0,01€

Energy cost

26%

Reduction in HVAC energy demands

74%

Internal Rate of Return

< 1 year

Payback

(*) Download the complete study [here](#).



Turner

Rafael Vinoly: a commitment to cutting-edge architecture.



Vinoly designed a project which stands out due to its sustainable, energy-efficient, innovative practices. His commitment to photovoltaic integration in buildings, and the inclusion of the largest photovoltaic skylight in the world in his design, make him the undisputed leader in his sector.

Rafael Vinoly is one of the architects who are most committed to sustainability and innovation in the international sphere. In 2013 he was awarded the Prize for Excellence in Civil Architecture by the American Society of Architects. Among his most emblematic projects, the Tokyo International Forum and Carrasco International Airport in Uruguay, which aims to become the first self-sufficient airport in the world, are of note.

“ The technical competence displayed by our team when faced by a highly complex project was decisive for the awarding of this contract.

Teodosio del Caño, CTO at Onyx Solar®.

SAN ANTON MARKET

PHOTOVOLTAIC SKYLIGHT



>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN MADRID

< 0,02€

Energy cost

34%

Reduction in HVAC energy demands

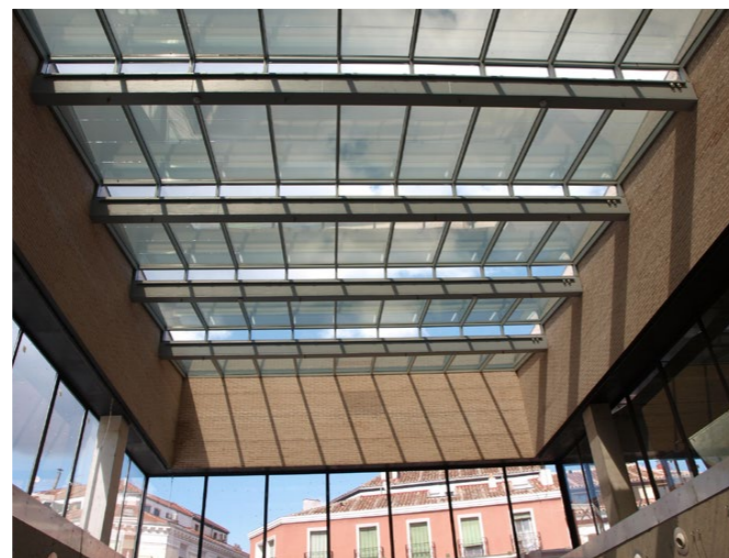
55%

Internal Rate of Return

<2 years

Payback

(*) Download the complete study [here](#).



This project is part of the refurbishment of San Anton Market, located in the centre of Madrid, where a **168 m²** skylight, comprised of transparent low-e photovoltaic glass, has been entirely integrated in the building.

The system enables the generation of electricity in situ, while providing multi-functional bioclimatic properties such as the filtration of solar radiation, and at the same time enhancing interior light and providing thermal and acoustic insulation thanks to its double-glazing.

The glass employed is made of amorphous silicon, with a **semi-transparency degree of 20% (L vision)**, and the total installed power capacity is **6.5 kWp**. This photovoltaic skylight generates over **7,700 kWh** per year and prevents the release of **5 tons of CO₂**. For this reason it has been selected as a **sustainable project of reference by the European Commission**.

OFFICIAL PARTNER OF THE EUROPEAN COMMISSION 2010

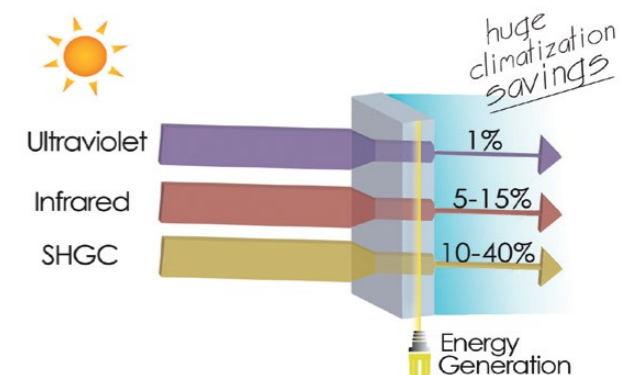


Official Partner

Onyx Solar® was selected as an Official Partner of the European Commission for "Sustainable Power for Europe" for the installation of the photovoltaic skylight at the San Anton Market.

TOTAL AREA	168 M2
ELECTRICITY GENERATED PER YEAR	7.748 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	424 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	4.990 CO2
BARRELS OF OIL SAVED PER YEAR	4 Barrels

OPTICAL PROPERTIES OF ONYX SOLAR®'S GLASS



Properties of Onyx Solar Low-E Photovoltaic Glass

Glass dimensions: 2536 x 1147 mm

VLT: L Vision

Wp per unit: 119

Technology: a-Si

General Contractor: Geocisa/
Dragados
Architect: QVE
Client: Madrid City Council

PILGRIM'S HOSTEL

PHOTOVOLTAIC WINDOWS AND DOOR

>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN AVILA

< 0,02€

Energy cost

34%

Reduction in HVAC energy demands

55%

Internal Rate of Return

<2 years

Payback

(*) Download the complete study [here](#).



The refurbishment of this small Hostel at Gotarrendura, Spain, includes the integration of low-e amorphous silicon photovoltaic glass in the windows and door. This is the only glass capable of filtering out **99% of ultraviolet radiation** and up to **95% of infrared radiation**, depending on the degree of semi-transparency selected.

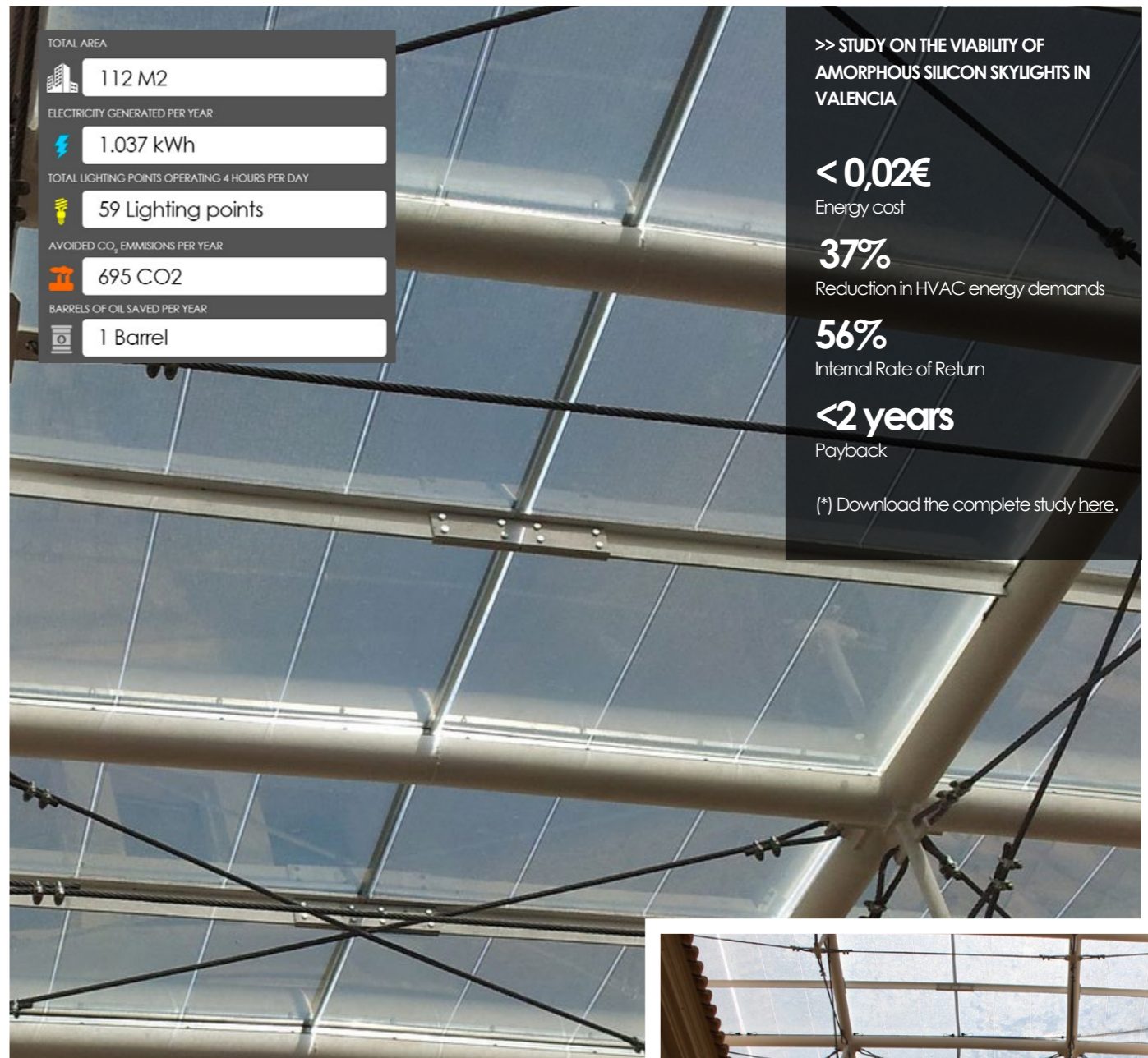
Thanks to this installation, this town in Avila was awarded the **Livcom prize** in Seoul. This prize commenced in 1997 to encourage innovation and leadership in the creation of

sustainable environments.

"This award represents a great success for the town, warranting the Town Council's commitment to the environment, to development and to well-being", says Fernando Martin, mayor of Gotarrendura, who received the award in Seoul, accompanied by Luis Arias-Romero, Spanish Ambassador in this Asian country.

ALZIRA TOWN HALL

PHOTOVOLTAIC SKYLIGHT



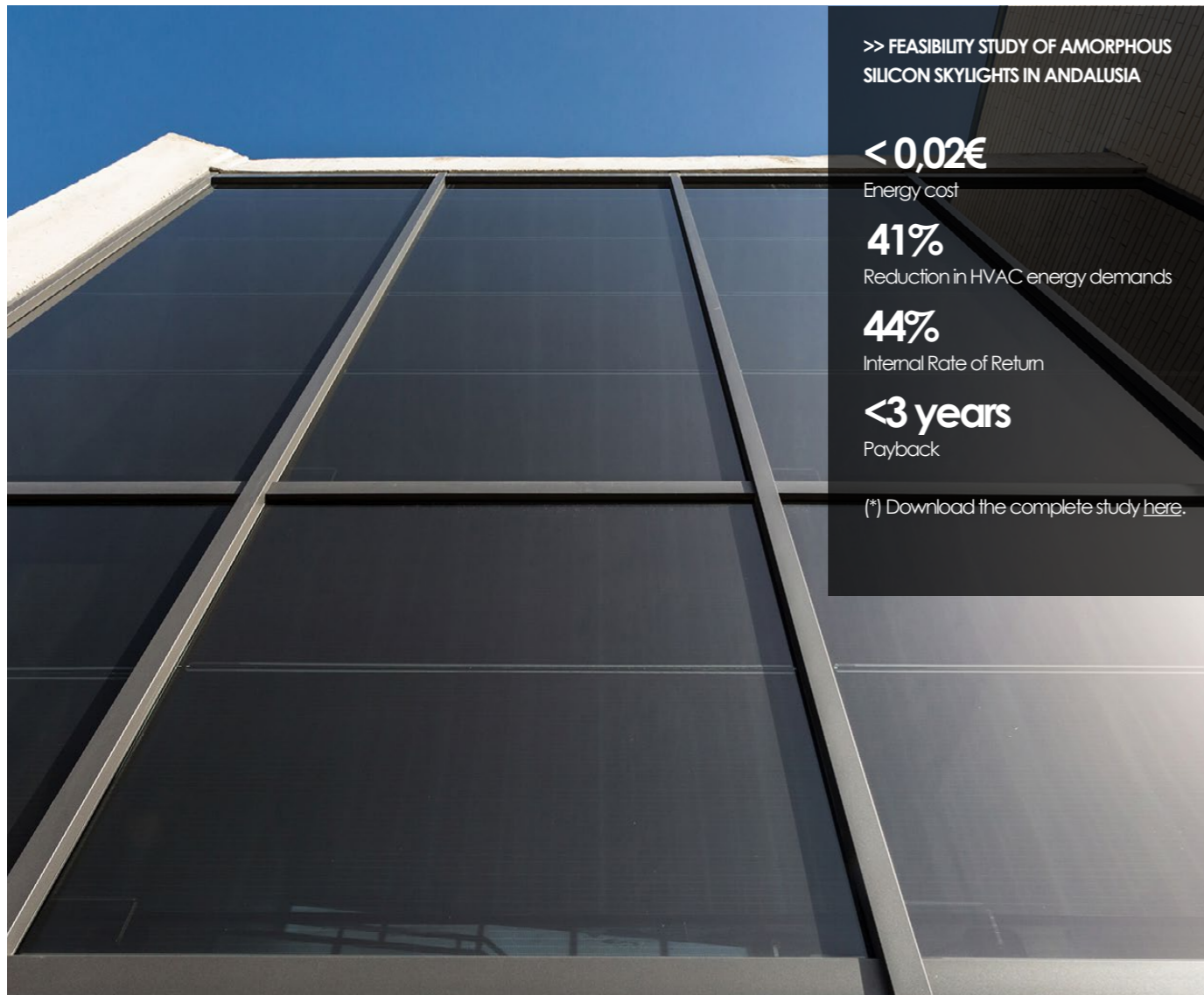
This photovoltaic skylight, integrated into the Town Hall of Alzira in Valencia, is comprised of **low-e amorphous silicon photovoltaic glass** modules with a semi-transparency degree of 10% (M vision).

The skylight enables the passage of daylight, facilitating the natural illumination of the courtyard while preventing the overheating of the building due to its **solar (g) factor of between 5% and 40%**, this making it an optimal choice for the prevention of the greenhouse effect, particularly in warm climates such as that of Valencia. Furthermore, due to its photovoltaic properties it generates over **1,000 kWh** yearly and prevents the release of almost **1 ton of CO₂ each year**. The total installed power capacity is **5.1 kWp**.



GDR HEADQUARTERS

PHOTOVOLTAIC CURTAIN WALL



>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN ANDALUSIA

< 0,02€

Energy cost

41%

Reduction in HVAC energy demands

44%

Internal Rate of Return

< 3 years

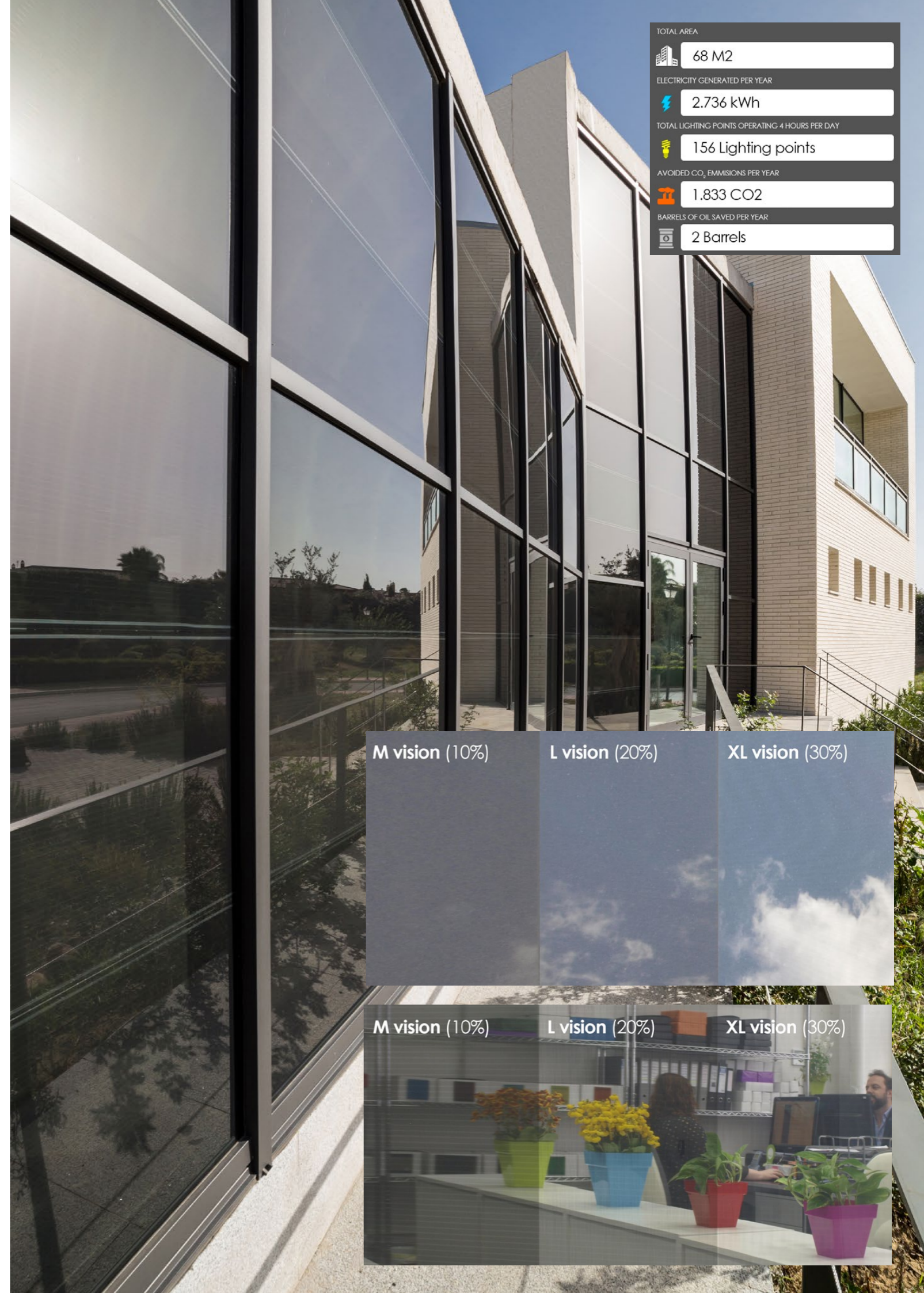
Payback

(*) Download the complete study [here](#).

Installation of a photovoltaic curtain wall at the new headquarters of the Guadalhorce Valley Rural Development Group, reducing the energy consumption of the building. This enclave, located in the province of Malaga, was born to be a Social, Economic and Environmental Innovation Centre to house the bodies and associations currently working in the region on the development, promotion and innovation of the valley.

This time, Onyx Solar®'s photovoltaic glass was installed on the façade of the building, forming a remarkable curtain wall capable of generating over **2,700 kWh** per year, with a peak installed power capacity of **2.5 kWp**.

The glass modules, made from amorphous silicon, are large-sized and were made to measure to satisfy the requirements of the client, the Andalusian regional government. It is of note that the photovoltaic glass employed is of the **low-emissivity (low-e)** type, which improves the thermal and acoustic insulation of the building and enhances energy savings in the same. It further features a **semi-transparency degree of 20% (L vision)**, which enables the uniform passage of light into the interior, reducing the need for artificial light while preventing the ingress of heat and the undesired greenhouse effect due to its **Solar (g) Factor of between 5% and 40%, depending on the degree of semi-transparency**. All the above is conducive to an improvement in the comfort of those inside, in addition to being in keeping with the natural surroundings of the location of these headquarters by preserving the aesthetics of the building.



TOTAL AREA	68 M2
ELECTRICITY GENERATED PER YEAR	2.736 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	156 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	1.833 CO ₂
BARRELS OF OIL SAVED PER YEAR	2 Barrels



COCA-COLA/FEMSA HEADQUARTERS

PHOTOVOLTAIC FAÇADE

TOTAL AREA
588 M2

ELECTRICITY GENERATED PER YEAR
17.223 kWh

TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY
981 Lighting points

AVOIDED CO₂ EMISSIONS PER YEAR
11.539 CO₂

BARRELS OF OIL SAVED PER YEAR
10 Barrels

Glass dimensions: 2735 x 635 mm,
1061 x 635 mm

VLT: L Vision, Color 00HH

Wp per unit: 66

Technology: a-Si

General Contractor:
Bioconstrucción
Client: FEMSA/Coca-Cola

Onyx Solar® executed the modernisation of the façade of Femsa's headquarters in Monterrey, Coca-Cola's main bottling plant worldwide.

This ventilated façade solution consists of integrating a double skin of photovoltaic glass whose mounting structure is not visible from inside the building.

To this end, **370 large-sized grey amorphous silicon glass modules**, with a **semi-transparency degree of 20% (L vision)**, were designed to measure.

The photovoltaic glass of the façade generates approximately **17,200 kWh** and prevents the release of over **11 tons of CO₂** into the atmosphere.

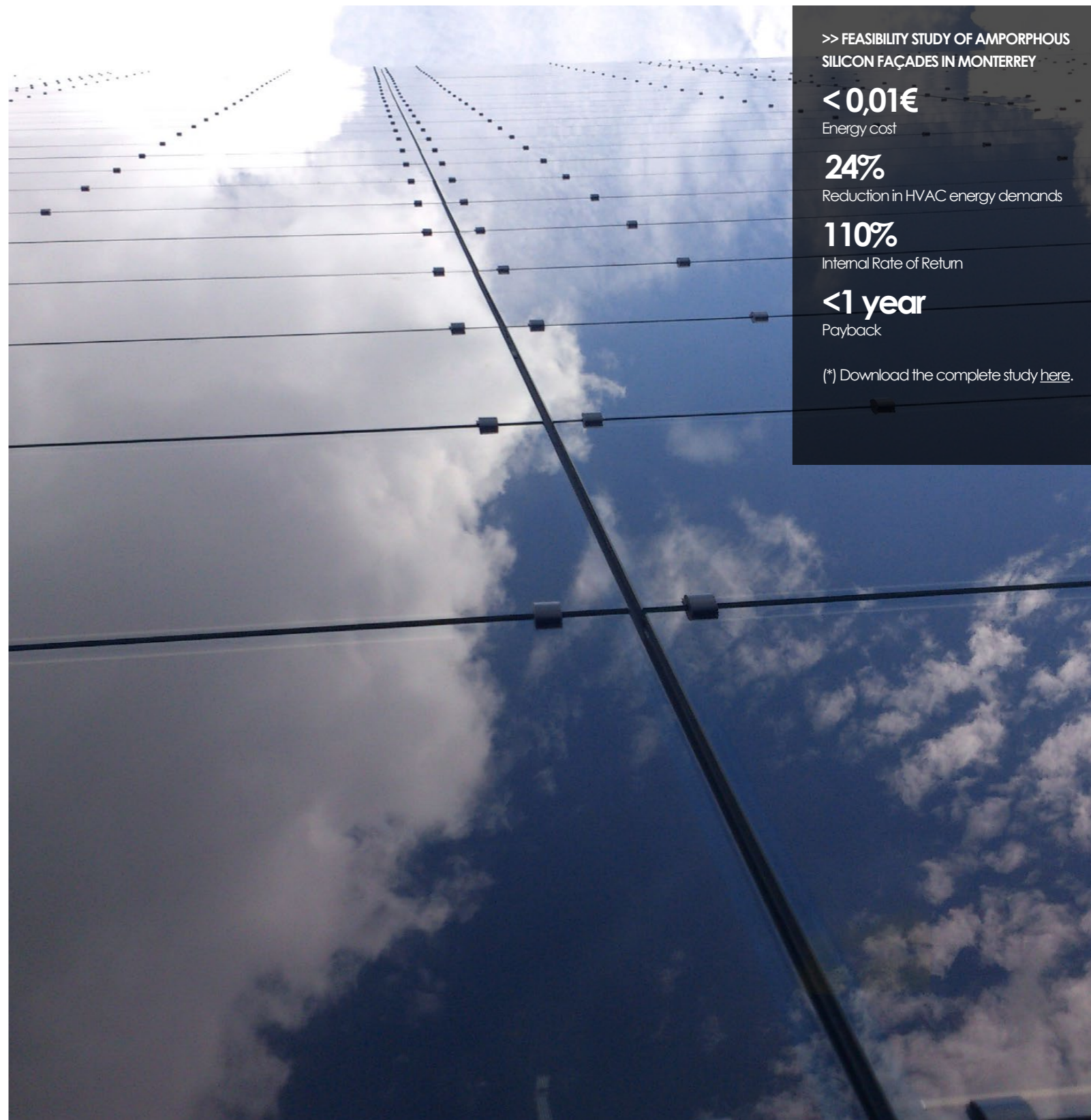
Furthermore, the ventilated façade is doubtless an optimal construction solution from an energy-efficient viewpoint. In fact, it has been estimated that the energy savings derived from the remarkable insulation produced by this construction solution may reach as much as **40%** of the energy requirements of the building. If we add to these savings the possibility of generating clean, free energy from the sun by means of the use of photovoltaic glass, we are doubtless looking at one of the most effective construction solutions on the market.

This project is included in the many initiatives directed and developed by Coca-Cola Femsa in their quest for sustainability and corporate responsibility.



“ Working on this project with Onyx Solar® has been a rewarding experience. Both companies took on the challenge to execute Mexico's first photovoltaic glass façade in record time, and the result has been most satisfactory. Like in all projects, working with top-notch specialised companies is a guarantee of success”.

Alfredo de la Rosa, Manager of Internal Civil Works at FEMSA.



>> FEASIBILITY STUDY OF AMPORPHOUS SILICON FAÇADES IN MONTERREY

<0,01€

Energy cost

24%

Reduction in HVAC energy demands

110%

Internal Rate of Return

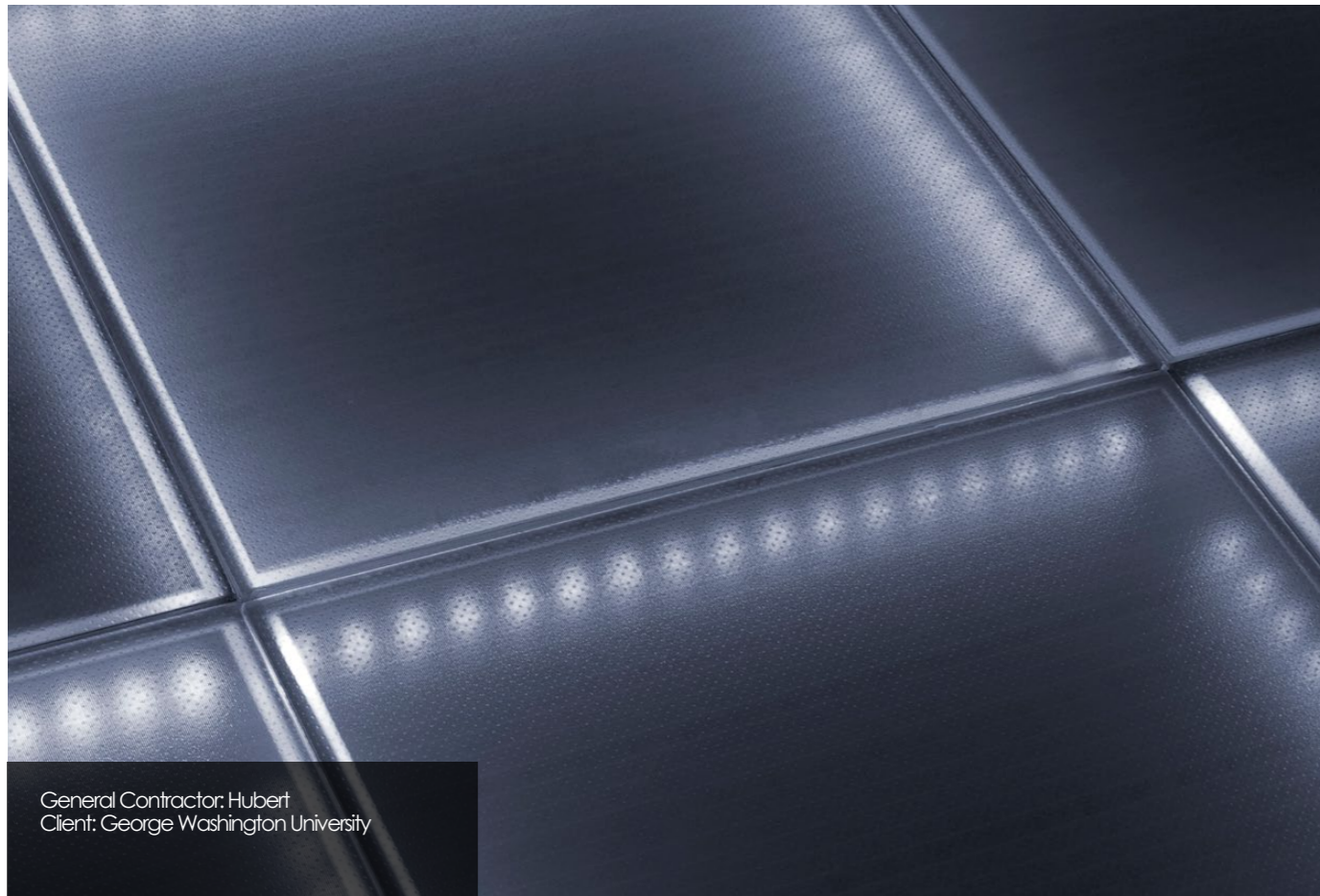
<1 year

Payback

(*) Download the complete study [here](#).

GEORGE WASHINGTON UNIVERSITY

PHOTOVOLTAIC FLOOR



General Contractor: Hubert
Client: George Washington University

George Washington University (GWU) has cooperated with Onyx Solar® in the installation of the first walkable photovoltaic floor in the world, located in the Science and Technology Campus in Ashburn, Virginia (USA).

The non-slip semi-transparent tiles forming the floor convert the solar radiation into energy by means of semiconductors. The total installed power capacity is **405 Wp**, sufficient to power the **450 LED lights** backlighting the walkway.

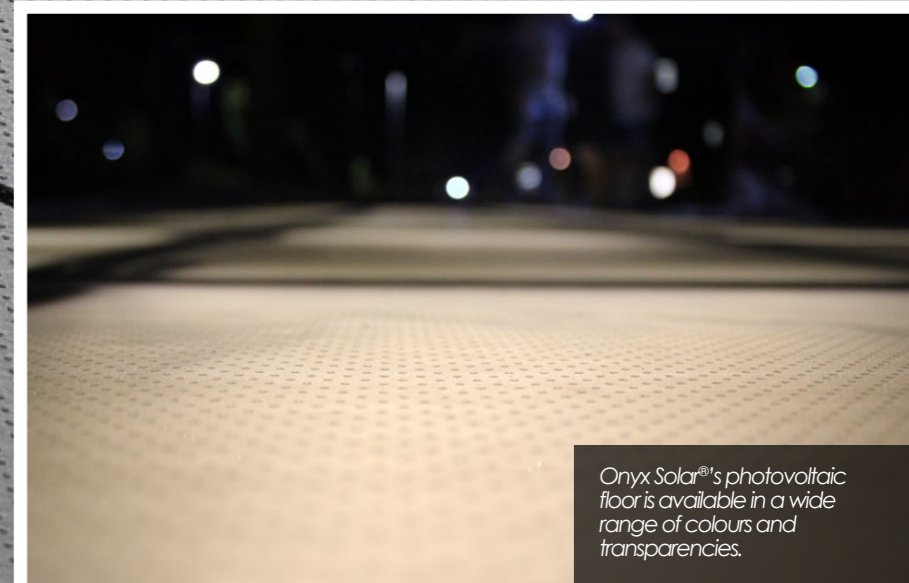
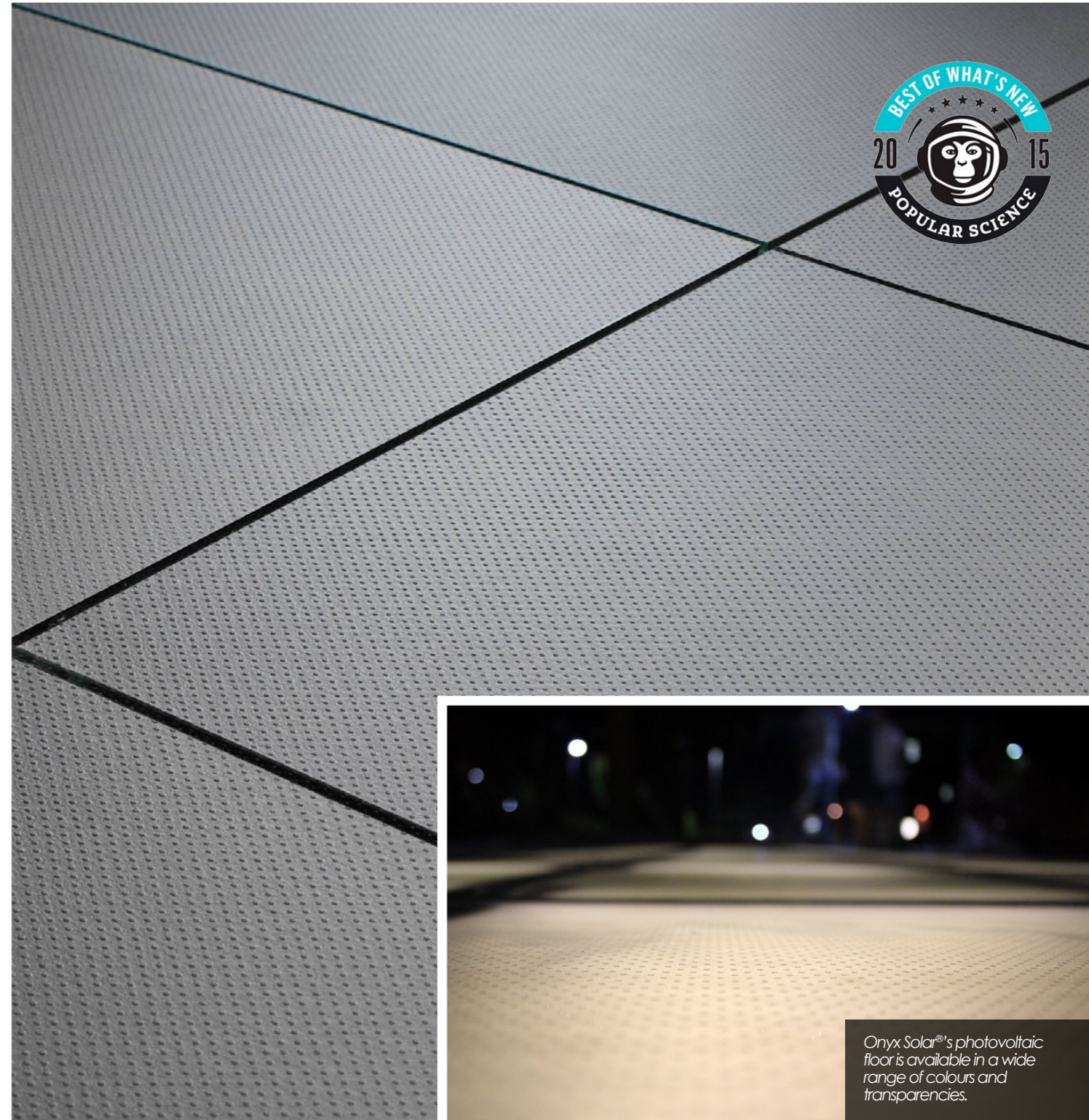
Thanks to the breakthroughs achieved by the company's R&D&i Department, this solution fulfils the highest technical standards; it complies with non-slip regulations and withstands 400 kg in the momentary load tests, and its installation is very simple, as it is laid like a raised floor, with plots.

Onyx Solar® has received awards on many occasions for developing and patenting the first non-slip photovoltaic glass floor in the world.



This installation is a good example of the University's commitment to sustainability and a reflection of the organisation's mentality, always with a clear view of the future".

Eric Selbst, Senior Land Use Planner at GWU.



Onyx Solar®'s photovoltaic floor is available in a wide range of colours and transparencies.

BOAT ON THE LAKE OF SANABRIA

PHOTOVOLTAIC SOLAR BOAT



Client: EUROPARQUES

The "Helios-Sanabria" is the **first wind- and solar-powered catamaran** in the world, and features the latest technology to perform didactic and pleasure excursions on the Lake of Sanabria in Zamora, Spain.

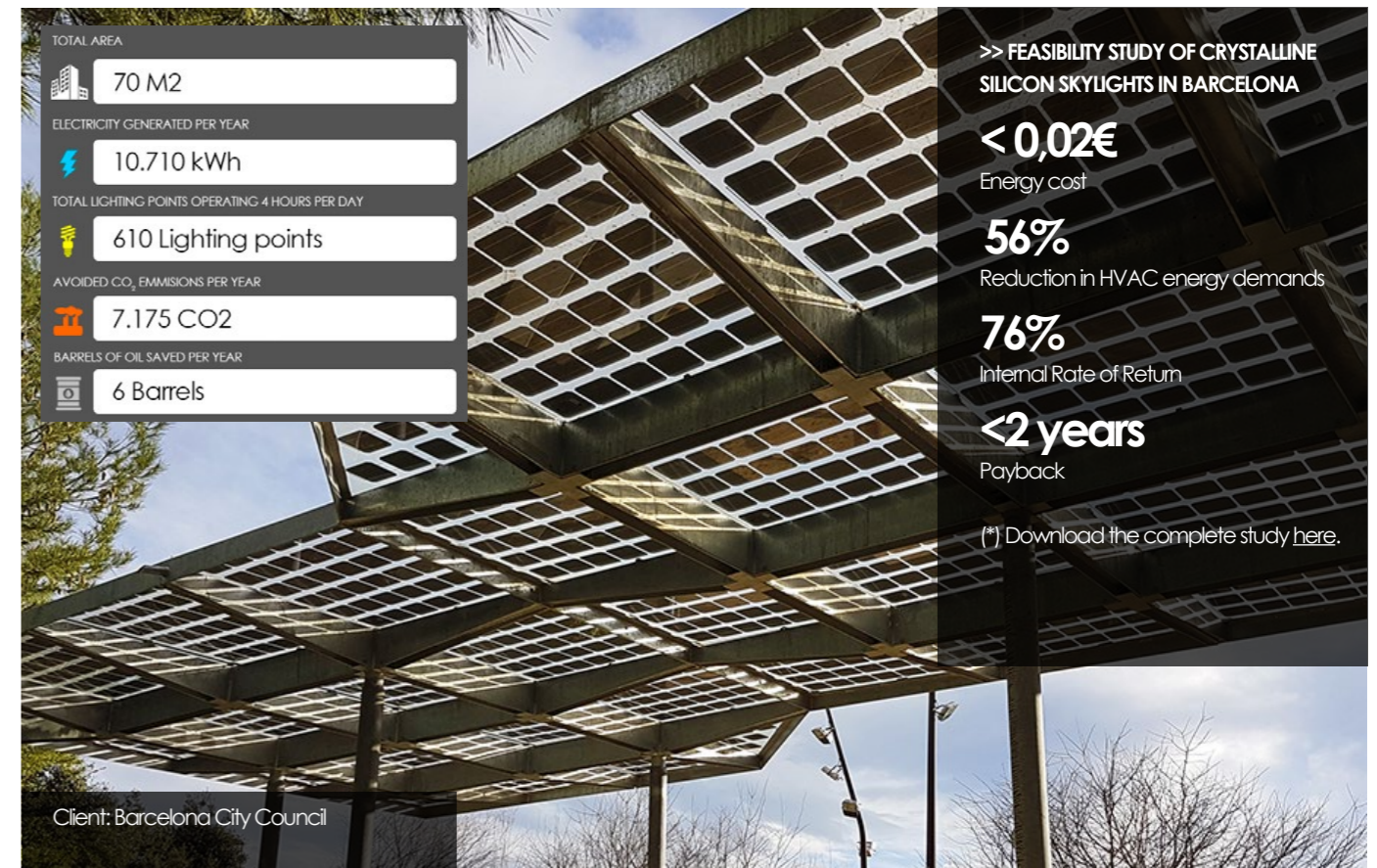
The catamaran features several green crystalline silicon photovoltaic glass modules by Onyx Solar®, with a **semi-transparency degree of 38%**.

This vessel is **100% environmentally-friendly**, with zero emissions, waste, effluents and zero decibels in the environmental noise rating.



RODRIGO CARO GARDENS

PHOTOVOLTAIC CANOPY



How is it possible to power **600 lights** in a public park efficiently, economically and sustainably? The Barcelona City Council, following its commitment to sustainability and efficiency, has no doubt at all: by installing photovoltaic glass.

For this reason, the Rodrigo Caro Gardens in Barcelona feature three magnificent photovoltaic glass pergolas. Glass modules which, in addition to providing shade for the citizens who enjoy this well-known park, generate nearly **11,000 kWh** per year cleanly and without cost, thanks to the sun.

Sufficient to power the **600 lights** throughout the park. Size of the modules: **1,255 x 1,240 mm**. Power: **183 Wp**.



PUNTA ARENAS HOSPITAL

PHOTOVOLTAIC CURTAIN WALL



>> FEASIBILITY STUDY OF CRYSTALLINE SILICON FAÇADES IN PUNTA ARENAS

< 0,07€

Energy cost

46%

Reduction in HVAC energy demands

16%

Internal Rate of Return

< 8 years

Payback

(*) Download the complete study [here](#).



Punta Arenas, Región de Magallanes y de la Antártida Chilena, Chile

General Contractor: Salfra Corp
Client: Magallanes Health Centre

Our photovoltaic glass has reached the southernmost city of the planet.

The high efficiency of our photovoltaic glass enables it to generate nearly **5,000 kWh** of clean, free energy from the sun, with a peak installed power capacity of **8.6 kWp**, even in the city nearest the South Pole, in the Chilean Antarctic.

This is a photovoltaic glass whose cell density was totally customised, in accordance with the client's design, to allow the entry of daylight. In this way, the glass, which incorporates

monocrystalline silicon cells, features a **degree of transparency of 70%**, enabling the passage of a large amount of light into the building while generating sufficient energy to supply **300 lights** for 4 hours each day.



TOTAL AREA	160 M2
ELECTRICITY GENERATED PER YEAR	4.867 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	277 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	3.261 CO ₂
BARRELS OF OIL SAVED PER YEAR	3 Barrels

EASTERN BANK

PHOTOVOLTAIC FAÇADE



>> FEASIBILITY STUDY OF AMORPHOUS SILICON FAÇADES IN DHAKA

< 0,01€

Energy cost

24%

Reduction in HVAC energy demands

57%

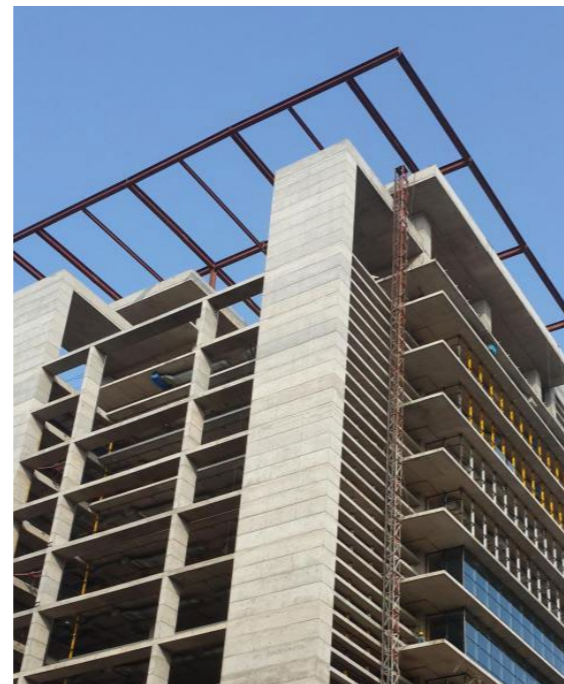
Internal Rate of Return

< 2 years

Payback

(*) Download the complete study [here](#).

Client: Eastern Bank



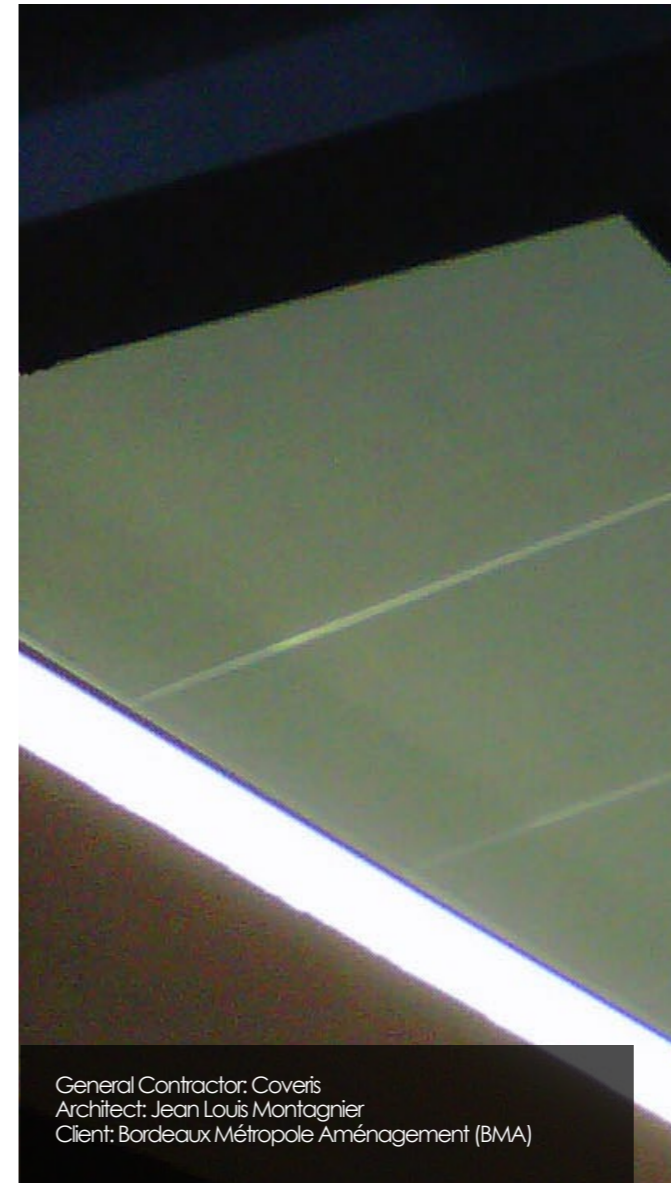
The new corporate headquarters of the Eastern Bank in Dhaka, Bangladesh, features a slatted amorphous silicon photovoltaic glass façade which makes it more efficient and sustainable.

The façade, of over **500 m²**, is comprised of low-emissivity (low-e) amorphous silicon glass modules with a **semi-transparency degree of 30% (XL vision)**, fitted by means of a system of slats. This enables the uniform passage of daylight into the building, while providing thermal insulation, preventing the undesired greenhouse effect within.

This glass is capable of filtering out **99% of ultraviolet** radiation and **95% of infrared** radiation, and features a **Solar (g) Factor of between 5% and 40%**, depending on the degree of transparency. A glass which enables the passage of daylight while also allowing the entry of heat, a critical factor in cities such as Dhaka, where temperatures of up to 40° are reached. The façade is capable of generating **22,600 kWh** per year, which makes it possible to power **1,300 lights** while preventing the release of **15 tons of CO₂** into the atmosphere. Its total installed power capacity is **12.5 kWp**.

OFFICE BUILDING

PHOTOVOLTAIC SKYLIGHT



General Contractor: Coveris
Architect: Jean Louis Montagnier
Client: Bordeaux Métropole Aménagement (BMA)

>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN PARIS

< 0,02€

Energy cost

33%

Reduction in HVAC energy demands

41%

Internal Rate of Return

< 3 years

Payback

(*) Download the complete study [here](#).

As part of the refurbishment of a historic building located by the River Garonne in Bordeaux (France), the complex has been equipped with a photovoltaic skylight measuring **48 m²**.

For this project, safety-laminated glass modules with an air gap were chosen; these improve the thermal and acoustic insulation of the building and generate a total of **2,500 kWh** per year, preventing the release of **1.6 tons of CO₂** into the atmosphere. The energy generated enables the powering of **141 lights** for the 4 hours per day required by the client.

The glass modules measure **2,954 x 1,240 mm** and feature a

degree of transparency of 10% (M vision). The glass has a **Solar (g) Factor of between 5% and 40%**, and is capable of filtering out **99%** of ultraviolet radiation and **95%** of infrared radiation, making it an optimal choice in the prevention of overheating of the building and thus enhancing the thermal comfort of its occupants.

The refurbishment of the building was managed by the town planning authority of the city, the Bordeaux Métropole Aménagement (BMA), and was designed by the architect Jean Louis Montagnier.

VALDECILLA HOSPITAL

PHOTOVOLTAIC CURTAIN WALL



ferrovial

>> FEASIBILITY STUDY OF AMORPHOUS SILICON FAÇADES IN SANTANDER

< 0,02€
Energy cost

57%
Reduction in HVAC energy demands

61%
Internal Rate of Return

< 2 years
Payback

(*) Download the complete study [here](#).

General Contractor: UTE Ferrovial – Siec
Architect: Herraiz Arquitectura
Client: Valdecilla Hospital

High efficiency for the refurbishment of the Marques de Valdecilla Hospital in Santander.

Among the energy efficiency measures incorporated in the new hospital facilities are the works executed on the three façades, where high-efficiency opaque monocrystalline silicon photovoltaic glass modules have been integrated. To this end, **69** safety laminated glass modules measuring **1,870 x 1,399 mm**, with a power capacity of **383 Wp** each and an efficiency of **15%** were installed. The total installed power capacity is **26.5 kWp**.

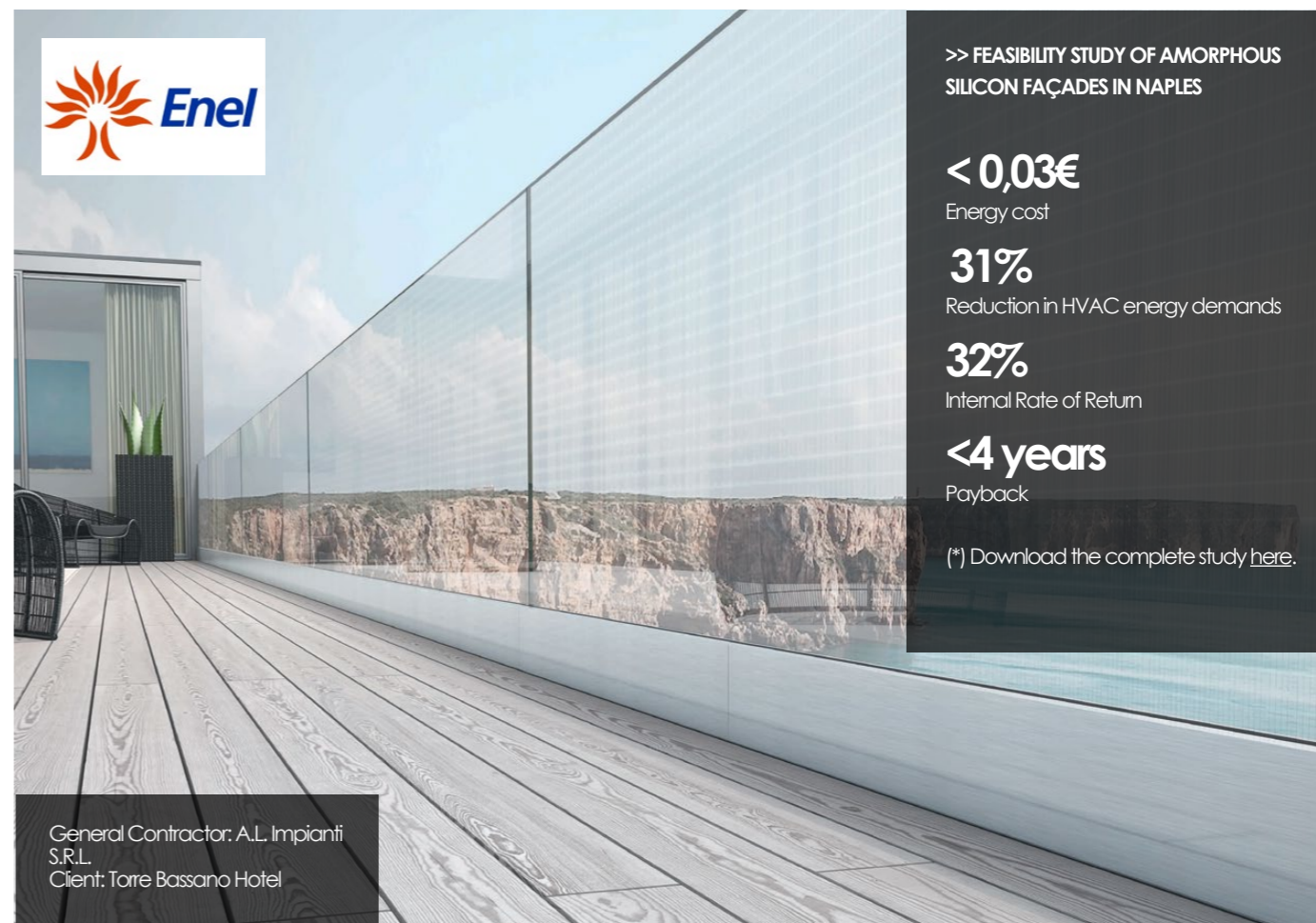
Our client, **Ferrovial**, is a worldwide referent in the infrastructure and services sector, a field in which it develops solutions characterised by their innovative nature and their sustainability.

The company has over 69,000 employees and is present in over 25 countries, belonging to prestigious sustainability indices such as the Dow Jones Sustainability Index: *"At Ferrovial we are totally committed to reducing the environmental impact of all our activities; we therefore use the best technologies developed for this purpose"*.

EFFICIENCY
15%

TORRE BASSANO HOTEL

PHOTOVOLTAIC RAILING



Enel

>> FEASIBILITY STUDY OF AMORPHOUS SILICON FAÇADES IN NAPLES

< 0,03€
Energy cost

31%
Reduction in HVAC energy demands

32%
Internal Rate of Return

< 4 years
Payback

(*) Download the complete study [here](#).

General Contractor: A.L. Impianti S.R.L.
Client: Torre Bassano Hotel

A Photovoltaic Balustrade at the foot of Vesuvius in the Gulf of Naples.

This photovoltaic balustrade is comprised of **342** amorphous silicon photovoltaic glass modules, designed to measure for the client (**1,128 x 950 mm**). These modules feature a **degree of semi-transparency of 30% (XL vision)**, enabling the hotel guests to enjoy a wonderful view of the Mediterranean.

The glass is a triple safety tempered laminate of **8mm + 3mm + 8mm**, and has withstood the strict tests required to guarantee the safety of the guests of this five-star hotel.

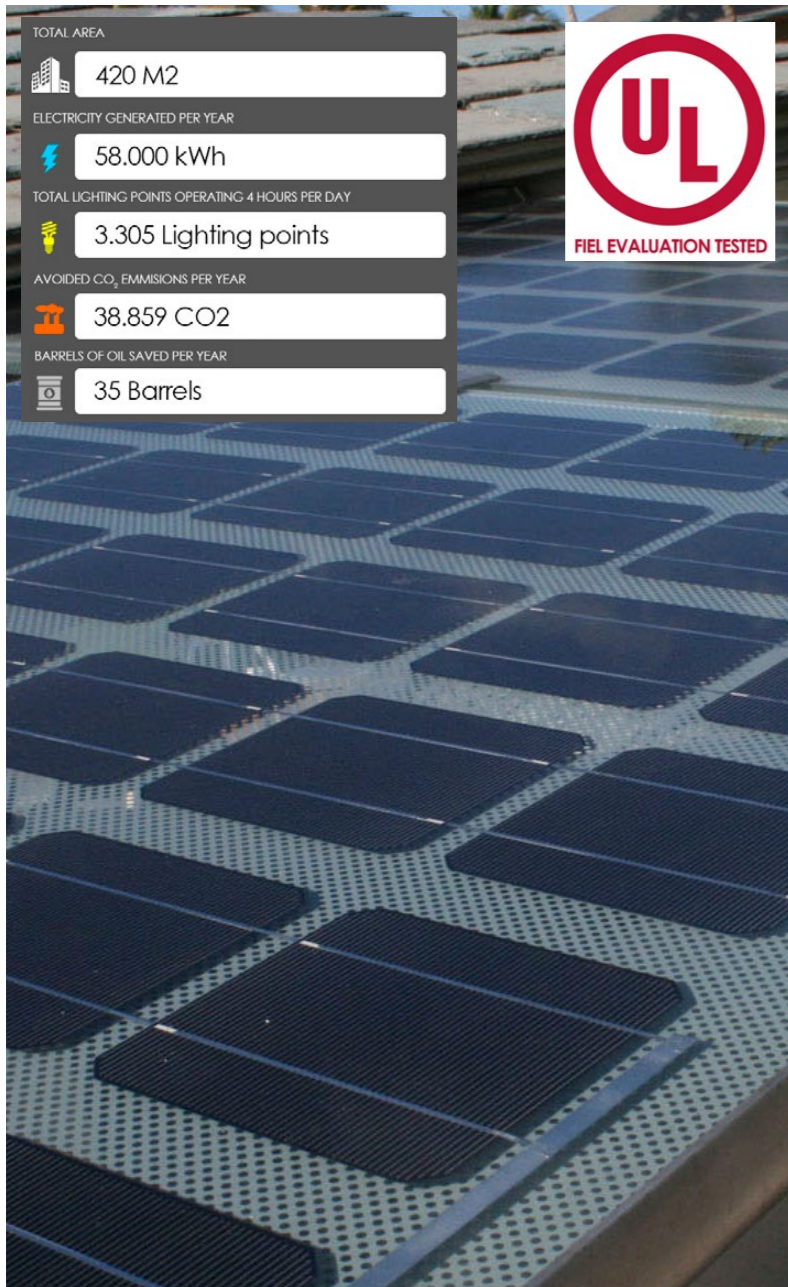
With a total installed power capacity of **11 kWp**, the balustrade generates **11,000 kWh** of power per year, sufficient to supply over **600 lights** for 4 hours each day and to prevent the release of **7 tons of CO₂** into the atmosphere.

The installation of the balustrade was executed in cooperation with **Enel**, the largest electricity company in Italy and the second largest in Europe.

"At Enel we are totally committed to energetic efficiency, the reduction of the environmental footprint, protection of the surroundings, and technological innovation" - Enel.

YAHOO

PHOTOVOLTAIC CANOPY




TOTAL AREA
420 M2

ELECTRICITY GENERATED PER YEAR
58.000 kWh

TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY
3.305 Lighting points

AVOIDED CO₂ EMISSIONS PER YEAR
38.859 CO₂

BARRELS OF OIL SAVED PER YEAR
35 Barrels



>> FEASIBILITY STUDY OF CRISTALLINE SILICON SKYLIGHTS IN HAWAII

<0,01€
Energy cost

41%
Reduction in HVAC energy demands

137%
Internal Rate of Return

<1 year
Payback

(*) Download the complete study [here](#).

This photovoltaic canopy, comprised of crystalline silicon glass, is located in Hawaii. Specifically in a building belonging to **Yahoo**, the Silicon Valley technology company.

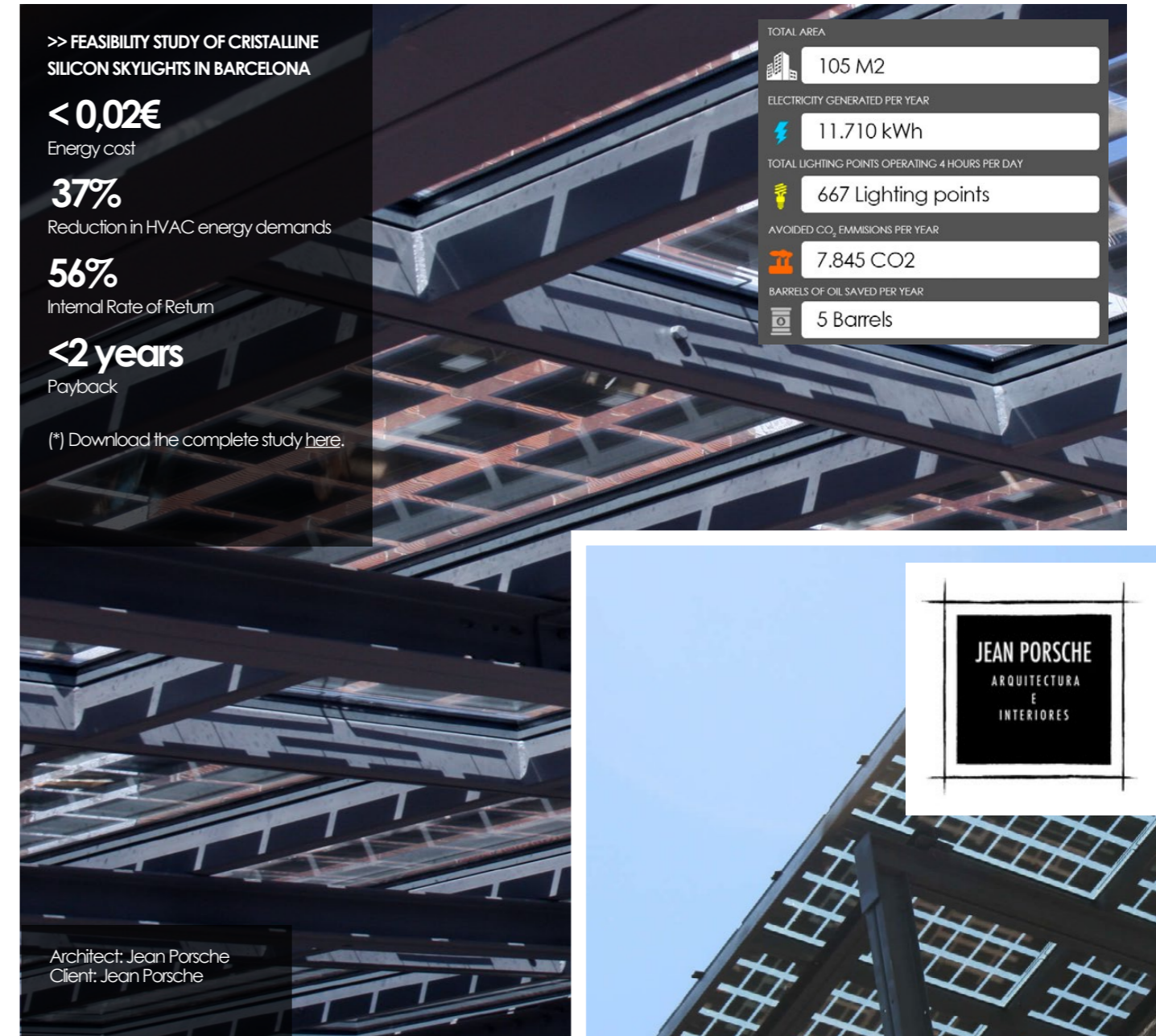
The canopy is made up of **320 glass modules** made entirely to measure for the project. Said modules are of safety **8 mm + 8 mm** laminated glass measuring **1,943 mm x 1,016 mm**, and are perfectly integrated into the building, in accordance with the aesthetics specified by the client.

The total installed power capacity is **34 kWp**, and it is capable of generating **58,000 kWh** per year, sufficient power to feed the **3,300 lights** in the building and to prevent the release of **38 tons of CO₂** into the atmosphere.

The glass also features a ceramic screen print on its reverse side, which filters out the harmful solar radiation while providing the glass with a uniform design.

XSCHE'S HOUSE

PHOTOVOLTAIC CANOPY



>> FEASIBILITY STUDY OF CRISTALLINE SILICON SKYLIGHTS IN BARCELONA

<0,02€
Energy cost

37%
Reduction in HVAC energy demands

56%
Internal Rate of Return

<2 years
Payback

(*) Download the complete study [here](#).

TOTAL AREA
105 M2

ELECTRICITY GENERATED PER YEAR
11.710 kWh

TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY
667 Lighting points

AVOIDED CO₂ EMISSIONS PER YEAR
7.845 CO₂

BARRELS OF OIL SAVED PER YEAR
5 Barrels

Architect: Jean Porsche
Client: Jean Porsche



This photovoltaic pergola has been installed in Barcelona to provide shade and comfort for the occupants of this residence, located in the midst of the Paseo de Gracia, and comprised of **70 crystalline silicon glass modules** measuring **1,650 mm x 850 mm**.

The safety photovoltaic glass modules, with a power capacity of **140 Wp**, generate **11,710 kWh** per year, enabling this residence to feed over **600 lights** and to prevent the release of over **7 tons of CO₂** into the atmosphere.

BOOTS PHARMACY

PHOTOVOLTAIC CURTAIN WALL



>> FEASIBILITY STUDY OF AMORPHOUS SILICON FULL ENVELOPE IN LONDON

< 0,09€

Energy cost

36%

Reduction in HVAC energy demands

10%

Internal Rate of Return

< 8 years

Payback

(*) Download the complete study [here](#).



Boots, the largest pharmacy chain in Great Britain and Ireland, now has a photovoltaic glass curtain wall at its offices in London, UK.

This curtain wall, designed especially for Boots by way of a showroom, is comprised of **low-emissivity (low-e) amorphous silicon glass modules**.

Each module has three different degrees of semi-transparency: M vision (10%), L vision (20%) and XL vision (30%). This will enable the company to study in situ the reduction in its electrical power consumption thanks to an innovative construction material which is also aesthetically attractive.

Boots pharmacy is a company committed to innovation and sustainability and which, like so many others, endeavours to improve the energetic efficiency of its stores and offices. It has approximately 2,500 stores in the United Kingdom, and since its merger with the American company Walgreens in 2012, it has become the largest purchaser of pharmaceutical products worldwide.

Client: Boots

PORT AUTHORITY

PHOTOVOLTAIC SKYLIGHT




>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN BALEARIC ISLANDS

< 0,02€

Energy cost

37%

Reduction in HVAC energy demands

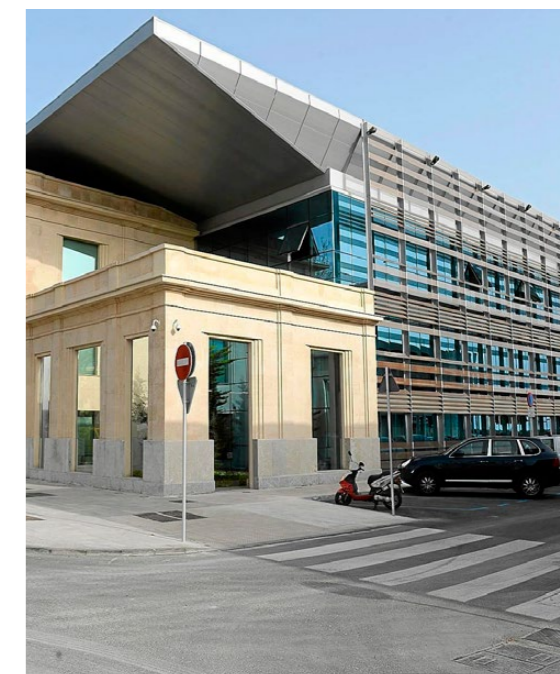
56%

Internal Rate of Return

< 2 years

Payback

(*) Download the complete study [here](#).



Installation of a photovoltaic skylight as part of the refurbishment of the Balearic Port Authority building in the Port of Majorca.

For this **180 m²** skylight, a **low-emissivity (low-e)** amorphous silicon glass was chosen, which also features an air gap to improve the insulation of the building even further and thus to prevent the undesirable greenhouse effect within.

The glass modules measure **2,200 mm x 1,300 mm** and feature a **degree of semi-transparency of 20% (L vision)**. Thus, the glass is able to permit the ingress of daylight while filtering out the harmful UV and IR radiation, which prevents the overheating of the building interior and significantly improves the comfort of its occupants.

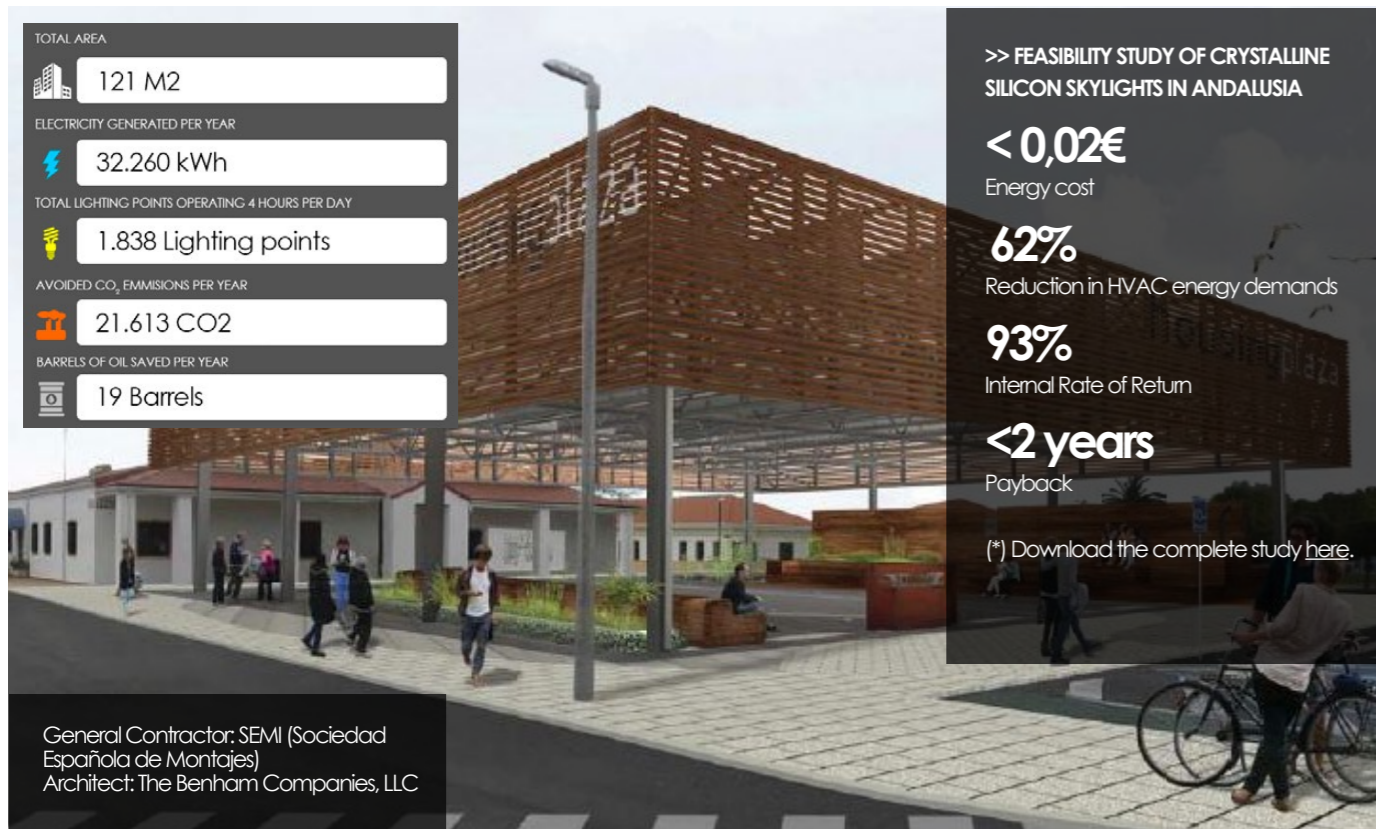
With an installed power capacity of **6 kWp**, this skylight is capable of generating **8,700 kWh** per year and of powering **500 lights** for 4 hours each day, while it prevents the release of nearly **6 tons of CO₂** into the atmosphere.

Acciona is one of the primary Spanish business corporations, a leader in the development and management of renewable energies and infrastructures.

General Contractor: Acciona
Client: Port Authority of Majorca

ROTA NAVAL BASE

PHOTOVOLTAIC SKYLIGHT



TOTAL AREA
121 M2

ELECTRICITY GENERATED PER YEAR
32.260 kWh

TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY
1.838 Lighting points

AVOIDED CO₂ EMISSIONS PER YEAR
21.613 CO₂

BARRELS OF OIL SAVED PER YEAR
19 Barrels

>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN ANDALUSIA

< 0,02€
Energy cost

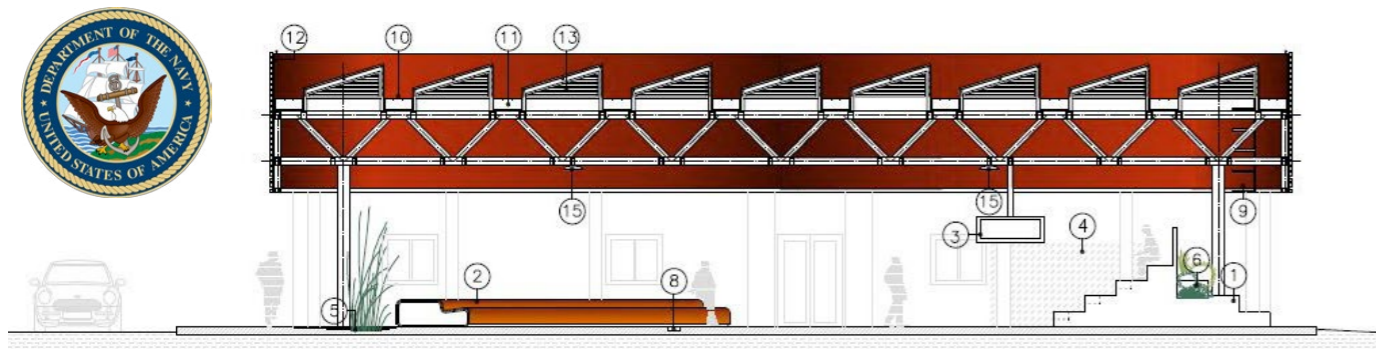
62%
Reduction in HVAC energy demands

93%
Internal Rate of Return

< 2 years
Payback

(*) Download the complete study [here](#).

General Contractor: SEMI (Sociedad Española de Montajes)
Architect: The Benham Companies, LLC



The project at the Rota Naval Base in Cadiz consists of the installation of photovoltaic glass modules in a structure executed with the aim of providing shade and generating renewable energy at this military base. 12% of the vast amount of power consumed by the American Navy is of renewable origin, and their aim is that this percentage should continue to grow.

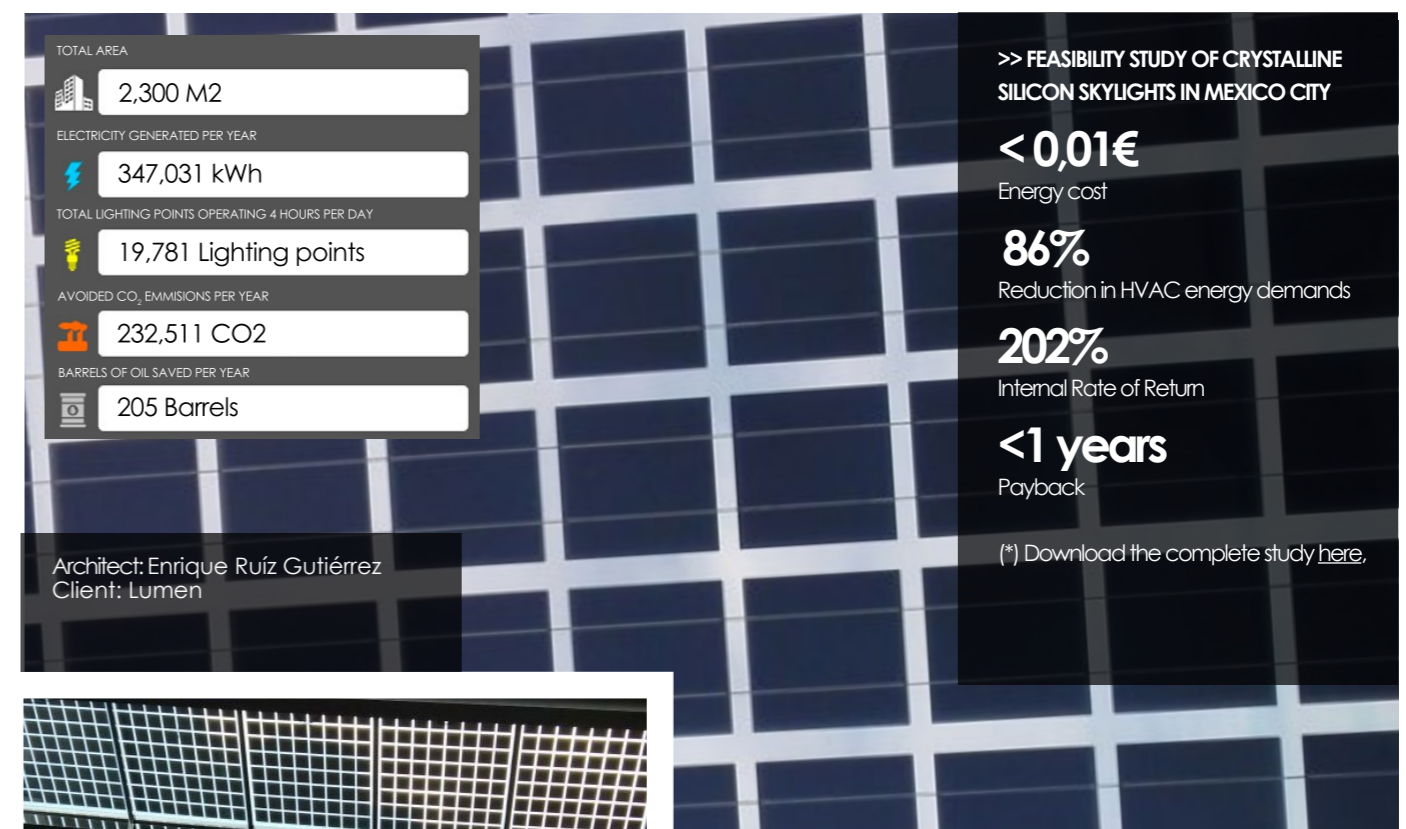
In this case, they decided on the integration of **high-efficiency** (15.20%) crystalline silicon laminated (6 + 6) photovoltaic glass modules, measuring **1,550 x 1,000 mm** and with a power capacity of **235 Wp**. To complete this **121 m²** structure **78**

modules were required, capable of generating nearly **33,000 kWh**, preventing the release of over **21 tons of CO₂** into the atmosphere and saving **19 barrels of oil** per year.

EFFICIENCY
15,20 %

SHOPPING CENTRE

PHOTOVOLTAIC SKYLIGHT



TOTAL AREA
2,300 M2

ELECTRICITY GENERATED PER YEAR
347,031 kWh

TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY
19,781 Lighting points

AVOIDED CO₂ EMISSIONS PER YEAR
232,511 CO₂

BARRELS OF OIL SAVED PER YEAR
205 Barrels

>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN MEXICO CITY

< 0,01€
Energy cost

86%
Reduction in HVAC energy demands

202%
Internal Rate of Return

< 1 years
Payback

(*) Download the complete study [here](#).

Architect: Enrique Ruíz Gutiérrez
Client: Lumen



Onyx Solar® has executed the installation of the largest photovoltaic skylight in Mexico City and one of the largest in the Americas, with a surface area of **2,300 m²**.

The installation of this skylight, under the auspices of and according to a project by the visionary architect Enrique Ruíz Gutiérrez, is located in the shopping centre belonging to the paper manufacturing company LUMEN.

This solution developed by Onyx Solar® is comprised of **800 polycrystalline** photovoltaic glass measuring **1,510 x 1,900 mm**. The peak installed power output is **258 kWp**, and it is capable of generating over **347,000 kWh** of energy per year, powering **19,800 lighting points** and preventing the release of **233 tons of CO₂** into the atmosphere.

“ It is no secret that many American cities have grown at the cost of the environment; therefore the only way to alleviate the damage caused is by using Onyx Solar’s® photovoltaic materials in construction. ”

Mauricio Vázquez Vela, CEO of BIPV MÉXICO, Official Distributor for Onyx Solar®



THE BLACK BOX

PHOTOVOLTAIC FAÇADE



The Black Box.

This is the name we have given to the building where we, the people who form part of Onyx Solar®, come each day to enjoy ourselves, to innovate and to develop 21st-century construction solutions. The building features a ventilated amorphous silicon photovoltaic glass façade.

The façade, generating **4.3 kWp**, is comprised of **310** laminated photovoltaic glass modules capable of generating **12,685 kWh** per year, thanks to which we prevent the release of nearly **9 tons of CO₂** into the atmosphere.

This represents an optimal construction solution which enables us to **save 53%** of our electricity bill.



>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN AVILA

< 0,04€
Energy cost

53%
Reduction in HVAC energy demands

93%
Internal Rate of Return

< 3 years
Payback

(*) Download the complete study [here](#).

“ There is no better way to study and make known our product than to install and monitor it in our own offices. In addition to generating energy, it confers a great aesthetic value on the building and the heating and cooling requirements have decreased, thanks to the thermal insulation provided by our façade in comparison with the traditional type”.

Ángel Gallego, Onyx Solar® architect entrusted with the façade design and works.

TOTAL AREA

245 M2

ELECTRICITY GENERATED PER YEAR

12.685 kWh

TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY

723 Lighting points

AVOIDED CO₂ EMISSIONS PER YEAR

8.499 CO2

BARRELS OF OIL SAVED PER YEAR

8 Barrels

ICSE

PHOTOVOLTAIC FAÇADE



Glass dimensions: 566 x 2800 mm, 488 x 2800 mm, 488 x 2772 mm, 472 x 2772 mm

VLT: L Vision

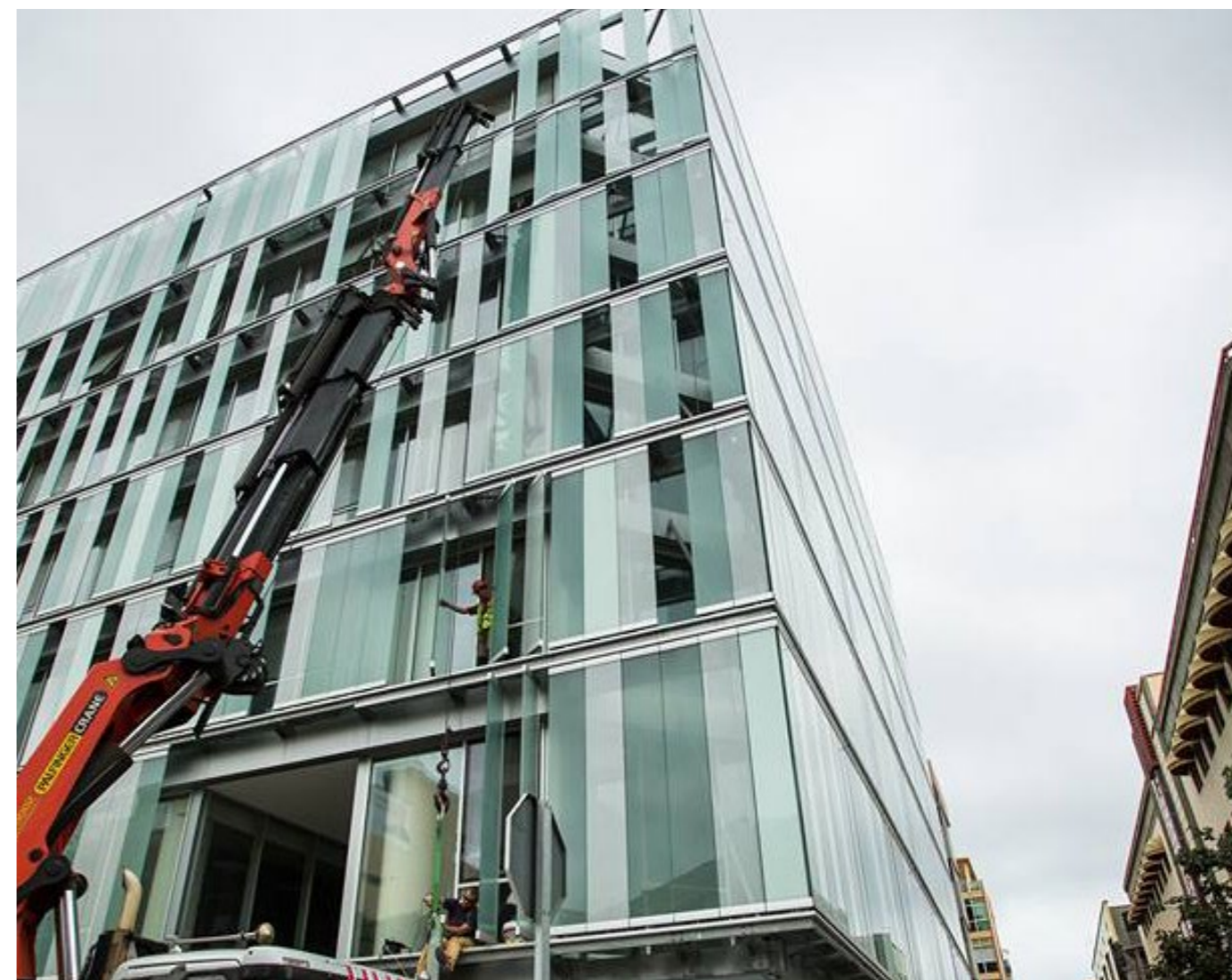
Wp per unit: 63, 54, 52

Technology: a-Si

Client: Las Palmas University

The new headquarters of the Canary Islands Higher Education Institution, located in Las Palmas de Gran Canaria, possesses a forefront technology which will make it the first **LEED Platinum** building in the Canary archipelago.

Onyx Solar® has contributed to this project with a system consisting of amorphous silicon photovoltaic glass slats integrated vertically into the façade. This is a triple-laminated glass, nearly **three metres long and half a metre wide**, with a degree of **semi-transparency of 20% (L vision)**, and combined with inactive glass modules to give the building a remarkable mosaic-like appearance. In addition to generating clean, free energy from the sun, these modules filter out the harmful radiation (UV & IR) and prevent the overheating of the interior, due to a Solar (g) Factor which is optimal for this type of warm climates.



>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN CANARY ISLANDS

< 0,02€
Energy cost

49%
Reduction in HVAC energy demands

52%
Internal Rate of Return

<4 years
Payback

(*) Download the complete study [here](#).

BART STATION

PHOTOVOLTAIC CANOPY



Glass dimensions: 1805 x 1137 mm

N. Units: 800

VLT: ceramic Fit

Wp per unit: 215

Technology: Si-mono

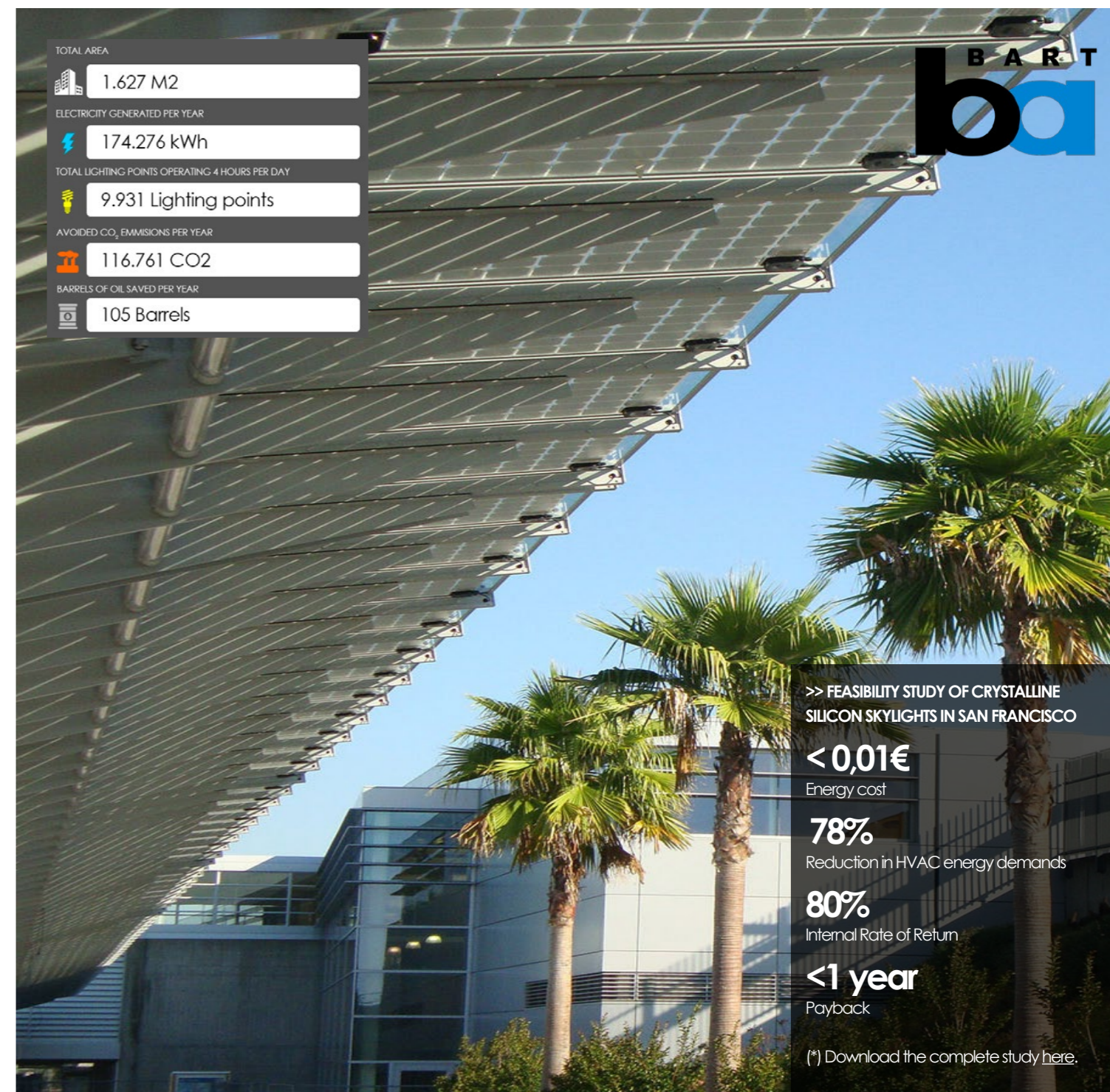
General Contractor: West Bay Builders
 Architect: Roma Architects
 Client: Union City District

Onyx Solar® has taken part in the refurbishment of the high-speed Union City station in San Francisco, supplying the safety laminated (8 + 8) photovoltaic glass included in the immense canopy of the new building.

The canopy is comprised of **800 crystalline silicon photovoltaic glass** modules measuring **1,805 mm x 1,137 mm**, totalling a power capacity of **172 kWp** (215 Wp per module). These modules are capable of generating **174,280 kWh** per year, sufficient to power **10,000 lights** and to prevent the release of almost **120 tons of CO₂** into the atmosphere and the consumption of **105 barrels of oil**.

The glass features a ceramic screen print on its reverse side, endowing the interior of the canopy with an elegant, uniform design.

This glass was designed especially for this project, which achieved **UL 1703** certification, a guarantee of its optimal efficiency and quality, ensuring compliance with the highest quality and safety standards in the case of mechanical or electrical issues, and also its resistance to fire.



“ Onyx Solar® was the only company capable of meeting all the requirements for the design of the project, and providing a solution of exceptional quality while working under difficult conditions, with a tight budget and short delivery schedules”.

Ivana Micic, ROMA Design Group.

This photovoltaic canopy was Onyx Solar®'s first project in the United States and it is considered to be one of the largest photovoltaic integration operations executed in the country. For this reason, it was leading news in many of the most significant journals of the sector, such as "Glass Magazine", belonging to the National Glass Association.

The station, included in the Bay Area Rapid Transit (BART) system, operates five lines over 167 km, and has 43 stations in four counties. This system carries over 320,000 passengers daily, placing it in fifth position of those most used in the United States.

>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN SAN FRANCISCO

< 0,01€
Energy cost

78%
Reduction in HVAC energy demands

80%
Internal Rate of Return

< 1 year
Payback

(*) Download the complete study [here](#).

GOVERNMENT BUILDING

PHOTOVOLTAIC CURTAIN WALL



This curtain wall, installed in Malta, is made of low-e amorphous silicon photovoltaic glass modules with a degree of **semi-transparency of 20% (L vision)**, enabling the passage of light into the interior and also enjoyment of the views. This type of glass filters out **99%** of the ultraviolet radiation and up to **95%** of infrared radiation. Its Solar (g) Factor is between **5% and 40%**, depending on the degree of semi-transparency, this being perfect for the prevention of the greenhouse effect within the buildings.

In this case, the glass also comprises an air gap to provide greater thermal insulation for the building.

The installation generates **3 kWp** and is comprised of **124 differently-sized and shaped glass** modules which were made to measure for this project.



VALLADOLID UNIVERSITY

PHOTOVOLTAIC SKYLIGHT



Glass dimensions: 2850 x 1245 mm
 VLT: M Vision
 Wp per unit: 165
 Technology: a-Si 2.3
 General Contractor: UTE San José - CYM Yañez
 Architect: Francisco Valbuena
 Client: Valladolid University

The LUCIA building (Spanish acronym of University Base for Applied Research Centres) at the University of Valladolid, has become the **most sustainable building in Europe and all the northern hemisphere**, due to aspects such as energy saving and respect for the environment.

Envisaged under principles of sustainable architecture, this building features various means for the generation of energy, among these the integration of two photovoltaic skylights and part of a curtain wall by Onyx Solar®. The low-emissivity glass employed, made of amorphous silicon, has a **semi-transparency degree of 10% (M vision)**. With an installed power capacity of **6 kWh**, it generates **5,550 kWh** of power yearly and prevents the release of **3.7 tons of CO₂**.

LUCIA stands out as a paradigm of energetic efficiency and sustainable architecture, as it **saves up to 60% of power consumption**. For this reason it has achieved the LEED Platinum Certificate, with 98 points, 5 leaves in Green Certification, the 2015 ENERAGEN Award in the Buildings category and third prize in 2013 from Mediterranean Sustainable Architecture, among others.

“The LUCIA building has been declared the most sustainable building in the northern hemisphere and the second worldwide, according to the LEED Platinum certification”

“Onyx™ has been a preferential technological partner in the development of the project, executing a highly innovative solution in the form of photovoltaic skylights, highly attractive systems from the point of view of sustainable construction and LEED certification”.

Francisco Valbuena, Valladolid University Technical Architecture Unit Director.

TOTAL AREA	128 M2
ELECTRICITY GENERATED PER YEAR	5.552 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	316 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	3.720 CO2
BARRELS OF OIL SAVED PER YEAR	3 Barrels

The LUCIA building is devoted to laboratories and research centres. The strategies employed are based on a painstaking architectural bioclimatic design; the use of renewable energy throughout (biomass, solar photovoltaic and geothermal-intensive), criteria for the reduction of power requirements, special attention to other matters such as water treatment, vegetation and waste management, and with a particular focus on social aspects. The building has achieved excellent financial results, and optimal results in energy saving and zero CO₂.

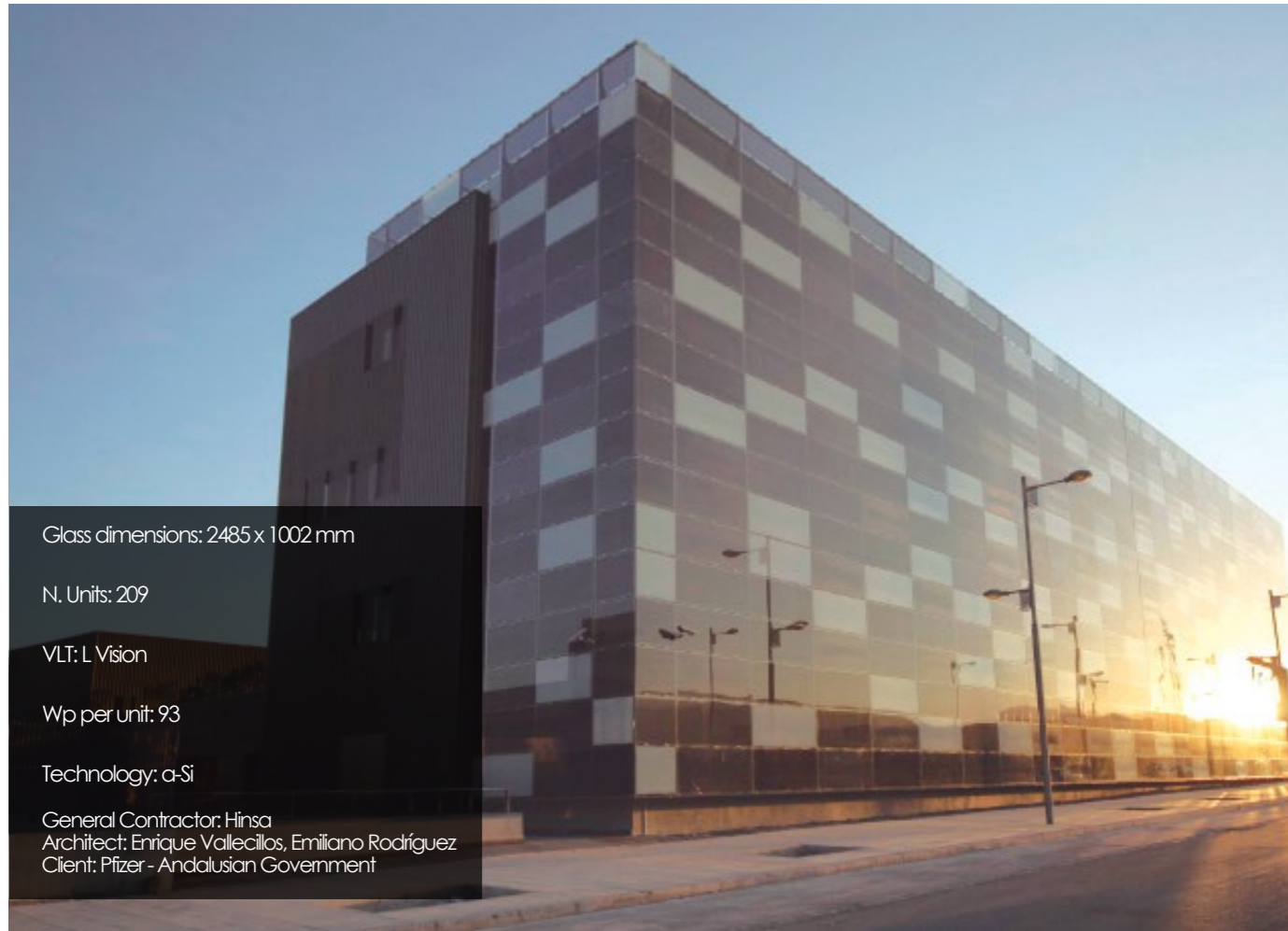
>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHT IN VALLADOLID

- < 0,02€ Energy cost
- 34% Reduction in HVAC energy demands
- 55% Internal Rate of Return
- < 2 years Payback

(*) Download the complete study [here](#).

GENYO BUILDING

PHOTOVOLTAIC FAÇADE



Glass dimensions: 2485 x 1002 mm
 N. Units: 209
 VLT: L Vision
 Wp per unit: 93
 Technology: a-Si
 General Contractor: Hinsa
 Architect: Enrique Vallecillos, Emiliano Rodríguez
 Client: Pfizer - Andalusian Government

The installation of a double skin on the façade of this building belonging to the multi-national pharmaceutical company Pfizer creates a spectacular pixelated mosaic of glass of different shades and sizes especially created for this project.

The façade features an active surface area of **550 m²** of amorphous silicon glass modules with a **semi-transparency degree of 20% (L vision)**.

This project has an installed power capacity of **19.3 kWp**, generating **32,000 kWh** of energy per year and preventing the consumption of **19 barrels of oil** yearly.

This building, envisaged as an area for research into the genetic basis of diseases, employs this photovoltaic double skin for the production of a large amount of the energy it consumes, specifically **1,814 lights** in the building itself.

Furthermore, the double skin thermally and acoustically insulates the building, providing significant savings in heating and air handling systems.



Our aim is to continue with our commitment to energetic efficiency and the use of renewable energy, provided that it is profitable and that it makes sense".
 Pfizer.

TOTAL AREA	1.062 M2
ELECTRICITY GENERATED PER YEAR	31.837 kWh
TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY	1.814 Lighting points
AVOIDED CO ₂ EMISSIONS PER YEAR	21.330 CO2
BARRELS OF OIL SAVED PER YEAR	19 Barrels

>> FEASIBILITY STUDY OF AMORPHOUS SILICON FAÇADES IN ANDALUSIA

< 0,02€
 Energy cost

41%
 Reduction in HVAC energy demands

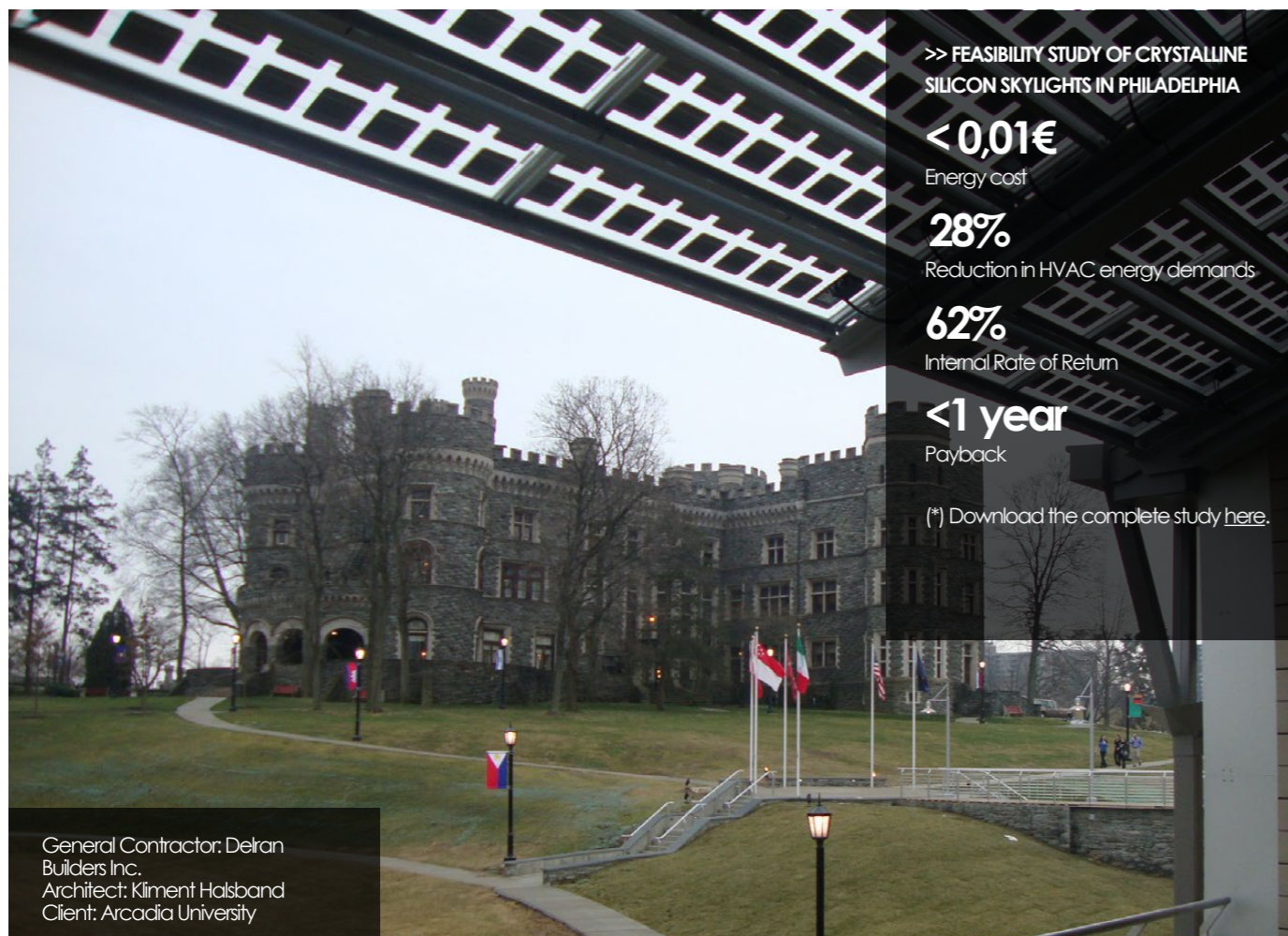
44%
 Internal Rate of Return

< 3 years
 Payback

(*) Download the complete study here

ARCADIA UNIVERSITY

PHOTOVOLTAIC CANOPY



>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN PHILADELPHIA

< 0,01€

Energy cost

28%

Reduction in HVAC energy demands

62%

Internal Rate of Return

< 1 year

Payback

(*) Download the complete study [here](#).

General Contractor: Delran Builders Inc.
Architect: Kliment Halsband
Client: Arcadia University

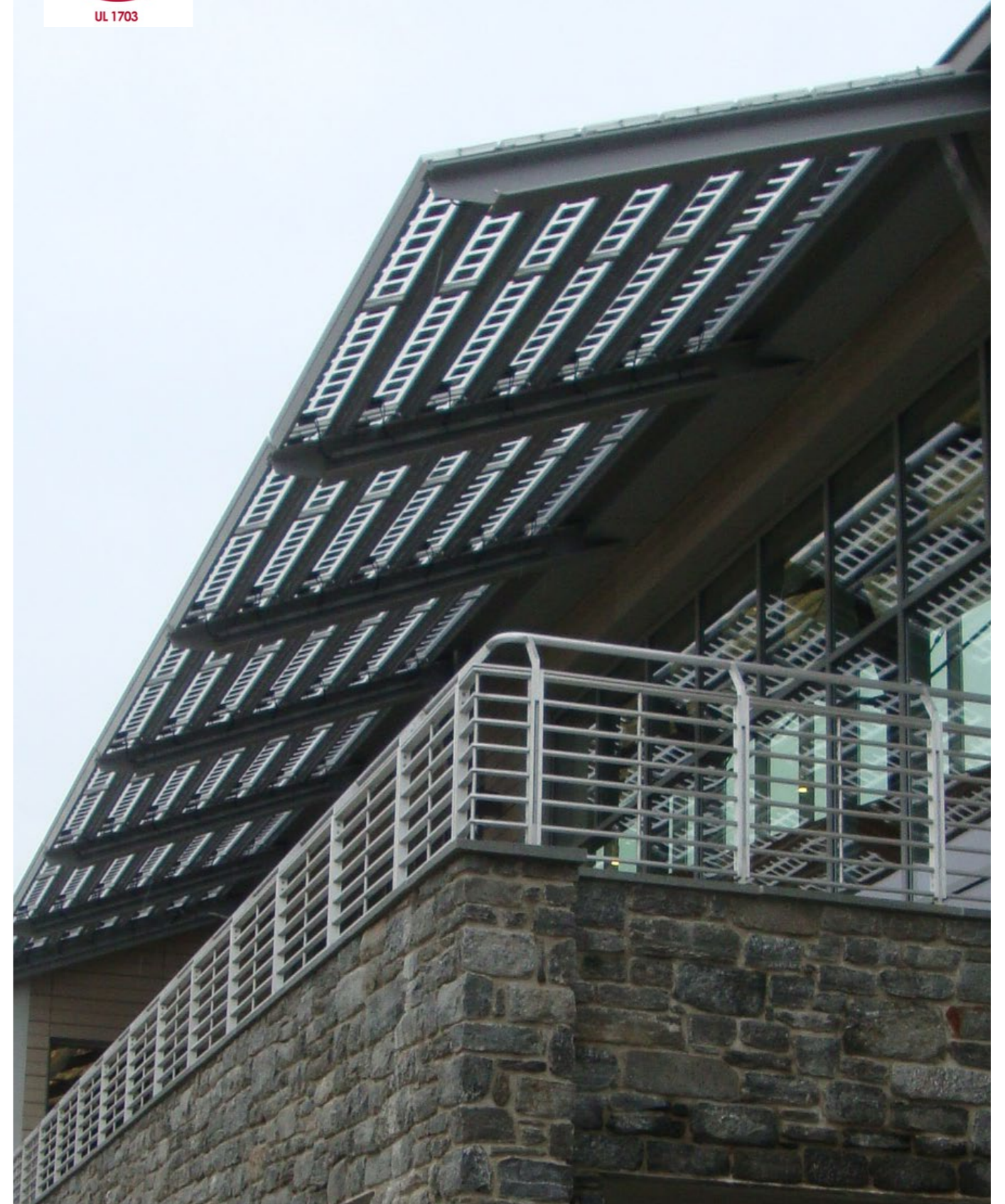
Integration of a photovoltaic sunshade in the new building of Arcadia University Campus, in the state of Pennsylvania (USA).

The famed Arcadia University was founded in 1853 in Glenside (Pennsylvania) and has over 4,000 students.

This solution provides a shaded area, totally integrated in the building and designed to measure, with a combination of monocrystalline silicon glass modules of two different sizes, giving the appearance of a mosaic. Furthermore, it generates **4.8 kWh** per year and prevents the release of **3.2 tons of CO₂** into the atmosphere and the consumption of **3 barrels of oil**.

“ Onyx Solar® has equipped Arcadia University with an integrated photovoltaic sunshade which has awoken a greater environmental conscience among the students. Onyx™ has done a great job and we recommend them for any project including innovative, high-quality solutions for photovoltaic integration.”

Chris Chapman, of Delran Builders, and Site Manager at Arcadia.



BURSAGAZ

PHOTOVOLTAIC FAÇADE



Glass dimensions: 500 x 700 mm

N. Units: 315

VLT: L Vision

Technology: a-Si

General Contractor: Sunvital
Architect: Tago Architects
Client: Bursagaz



Bursagaz, the natural gas distributor in Bursa, the fourth largest city in Turkey, with 1.5 million inhabitants, was formed in 2008 and has grown considerably, now being the third largest company of the sector in the country. Among the pillars of Bursagaz's corporate strategy is the development of innovative projects contributing to a more sustainable future.

Bursagaz, one of the principal companies in the natural gas sector in Turkey, has a new headquarters in the city of Bursa, which it is hoped will obtain the **LEED Gold Certification**.

Onyx Solar® has been entrusted to provide the building with a touch of originality by integrating a double skin of photovoltaic glass in the form of a mosaic, which is superimposed on the façade. The **315 amorphous silicon glass** modules, measuring **500 mm x 700 mm**, have a **degree of transparency of 20% (L vision)**, enabling the uniform passage of light into the building and thus reducing the need for artificial lighting. This is a **4.1 kWp** installation, generating approximately **3,400 kWh** per year.

CENTRE FOR SCIENCE

PHOTOVOLTAIC CANOPY

>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN AUSTRALIA

< 0,01€
Energy cost

52%
Reduction in HVAC energy demands

87%
Internal Rate of Return

< 2 years
Payback

(*) Download the complete study [here](#).

TOTAL AREA
110 M2

ELECTRICITY GENERATED PER YEAR
2,051 kWh

TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY
117 Lighting points

AVOIDED CO₂ EMISSIONS PER YEAR
1,374 CO₂

BARRELS OF OIL SAVED PER YEAR
1 Barrels

Client: Scotch College

The Scotch College, founded in 1851, is the oldest secondary school in Victoria, Australia.

The Campus, located in the heart of Melbourne, has executed the construction of a building called "The Sir Zelman Cowen Centre for Science", with the aim of being a **showcase of environmental sustainability**, where Onyx Solar® just had to be present.

The solution developed by Onyx Solar® at Scotch College consists of the installation of a photovoltaic pergola on the roof of the building. This is formed of **amorphous silicon**

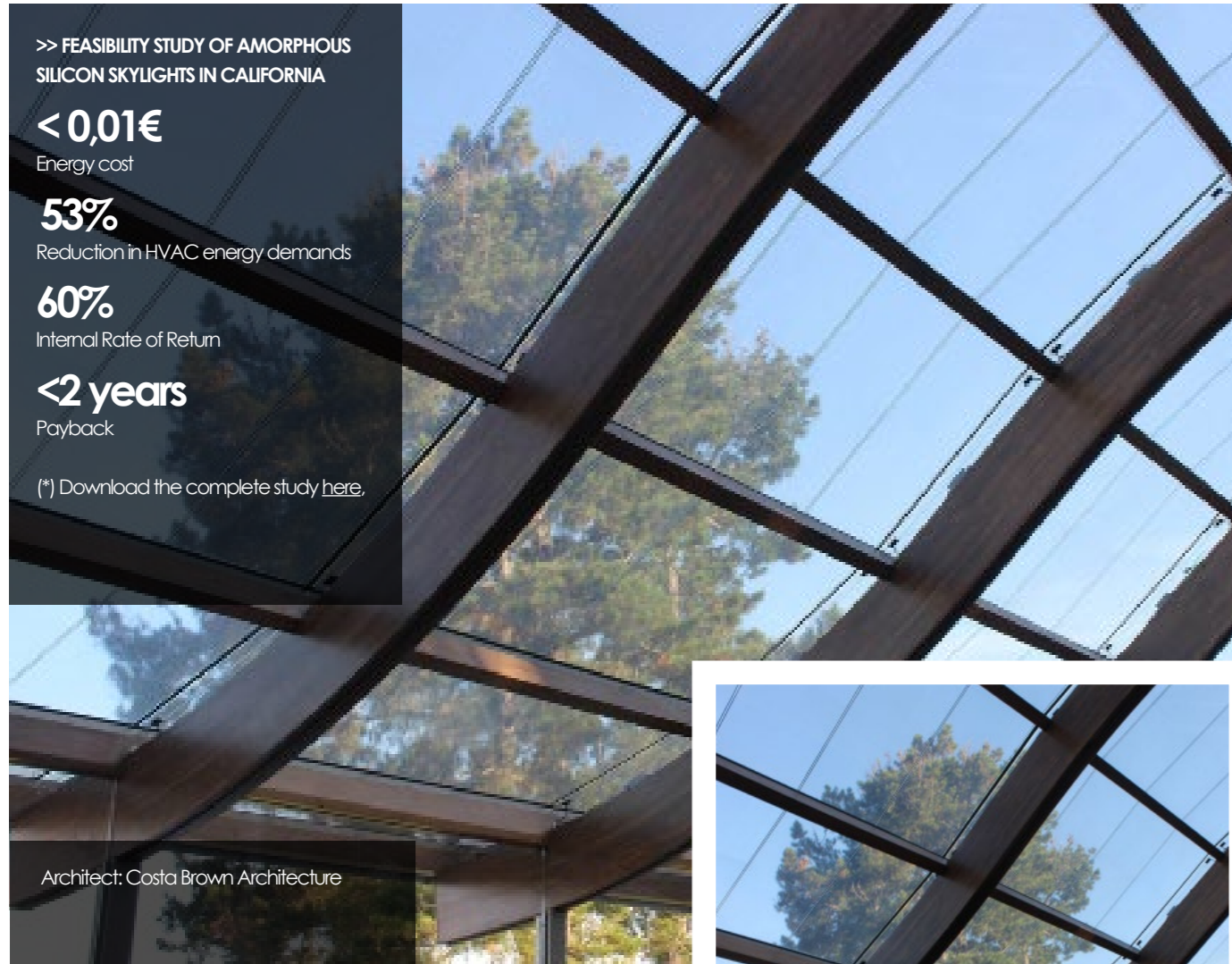


glass with a **degree of transparency L vision (20%)**, enabling the ingress of daylight while providing considerable thermal protection.

The total installed power is **3.7 kWp**, enabling the school to generate **2,051 kWh** per year and to power nearly **120 lights** cost-free and cleanly, thanks to the sun. it also prevents the release of **1.4 tons of CO₂** into the atmosphere.

HIGH-END RESIDENTIAL

PHOTOVOLTAIC SKYLIGHT



>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN CALIFORNIA

< 0,01€

Energy cost

53%

Reduction in HVAC energy demands

60%

Internal Rate of Return

< 2 years

Payback

(*) Download the complete study [here](#).

Architect: Costa Brown Architecture



this wonderful swimming pool with sea views from the sun's rays.

This skylight has a total installed power capacity of **6.59 kWp**, and enables the residence to generate approximately **10,595 kWh** per year.

"The visual effect of the photovoltaic glass modules is surprising. The clients are delighted with this product". Ken Lin, architect at Costa Brown Architecture.

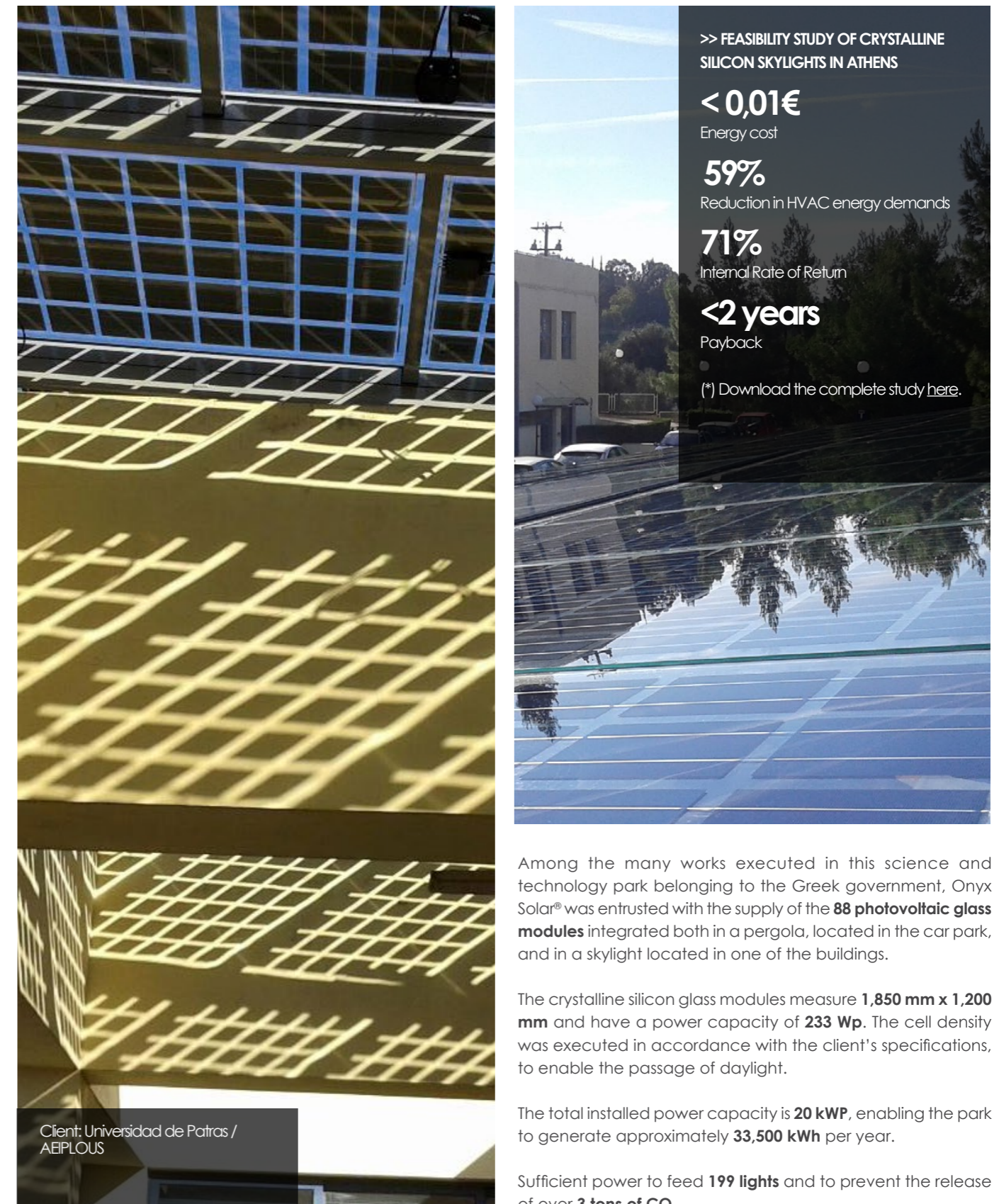
It is located in an exclusive town of 9,000 inhabitants in Marin County, beside the Bay of San Francisco, offering privileged views of the city and the iconic Golden Gate bridge.

Onyx Solar® has taken part in the modernisation of a luxury residence where innovation and sustainability are priority. The photovoltaic glass has been integrated in the form of a skylight, thus providing the building with an air-conditioned swimming pool. The skylight has an original fairground switchback-like shape, thanks to the curved wooden structure on which the nearly **72 photovoltaic glass modules** rest.

The glass employed is triple-laminated, made of amorphous silicon, with a **semi-transparency degree of 20% (L vision)**. Due to this, the thermal and acoustic comfort of the users of this pool has been increased, as the interior temperature is maintained constant. Furthermore, **it filters out up to 99% of the ultraviolet radiation, an extra which protects those who enjoy**

PATRAS SCIENTIFIC PARK

PHOTOVOLTAIC SKYLIGHT AND PARKING LOT



>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN ATHENS

< 0,01€

Energy cost

59%

Reduction in HVAC energy demands

71%

Internal Rate of Return

< 2 years

Payback

(*) Download the complete study [here](#).

Client: Universidad de Patras / AEPLIOUS

Among the many works executed in this science and technology park belonging to the Greek government, Onyx Solar® was entrusted with the supply of the **88 photovoltaic glass modules** integrated both in a pergola, located in the car park, and in a skylight located in one of the buildings.

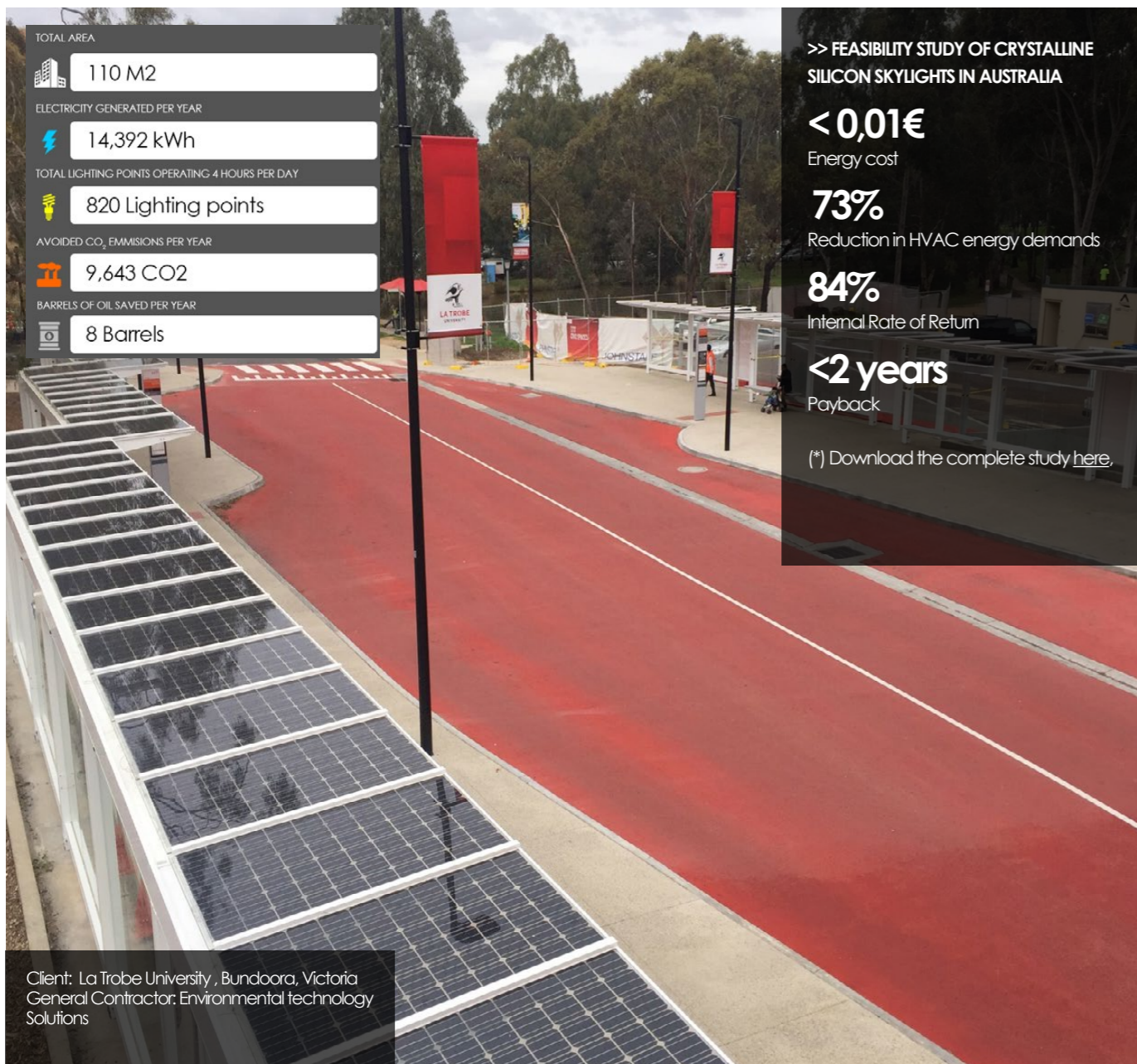
The crystalline silicon glass modules measure **1,850 mm x 1,200 mm** and have a power capacity of **233 Wp**. The cell density was executed in accordance with the client's specifications, to enable the passage of daylight.

The total installed power capacity is **20 kWp**, enabling the park to generate approximately **33,500 kWh** per year.

Sufficient power to feed **199 lights** and to prevent the release of over **3 tons of CO₂**.

LA TROBE UNIVERSITY

PHOTOVOLTAIC CANOPY



TOTAL AREA
110 M2

ELECTRICITY GENERATED PER YEAR
14,392 kWh

TOTAL LIGHTING POINTS OPERATING 4 HOURS PER DAY
820 Lighting points

AVOIDED CO₂ EMISSIONS PER YEAR
9,643 CO₂

BARRELS OF OIL SAVED PER YEAR
8 Barrels

>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN AUSTRALIA

< 0,01€
Energy cost

73%
Reduction in HVAC energy demands

84%
Internal Rate of Return

<2 years
Payback

(*) Download the complete study [here](#).

Client: La Trobe University , Bundoora, Victoria
General Contractor: Environmental technology Solutions

Founded over 40 years ago, La Trobe University is a multi-campus with 5,000 teaching staff and researchers, 30,000 students and 5 faculties. As part of its **great commitment to caring for the environment it has committed itself to Onyx Solar®'s photovoltaic solutions.**

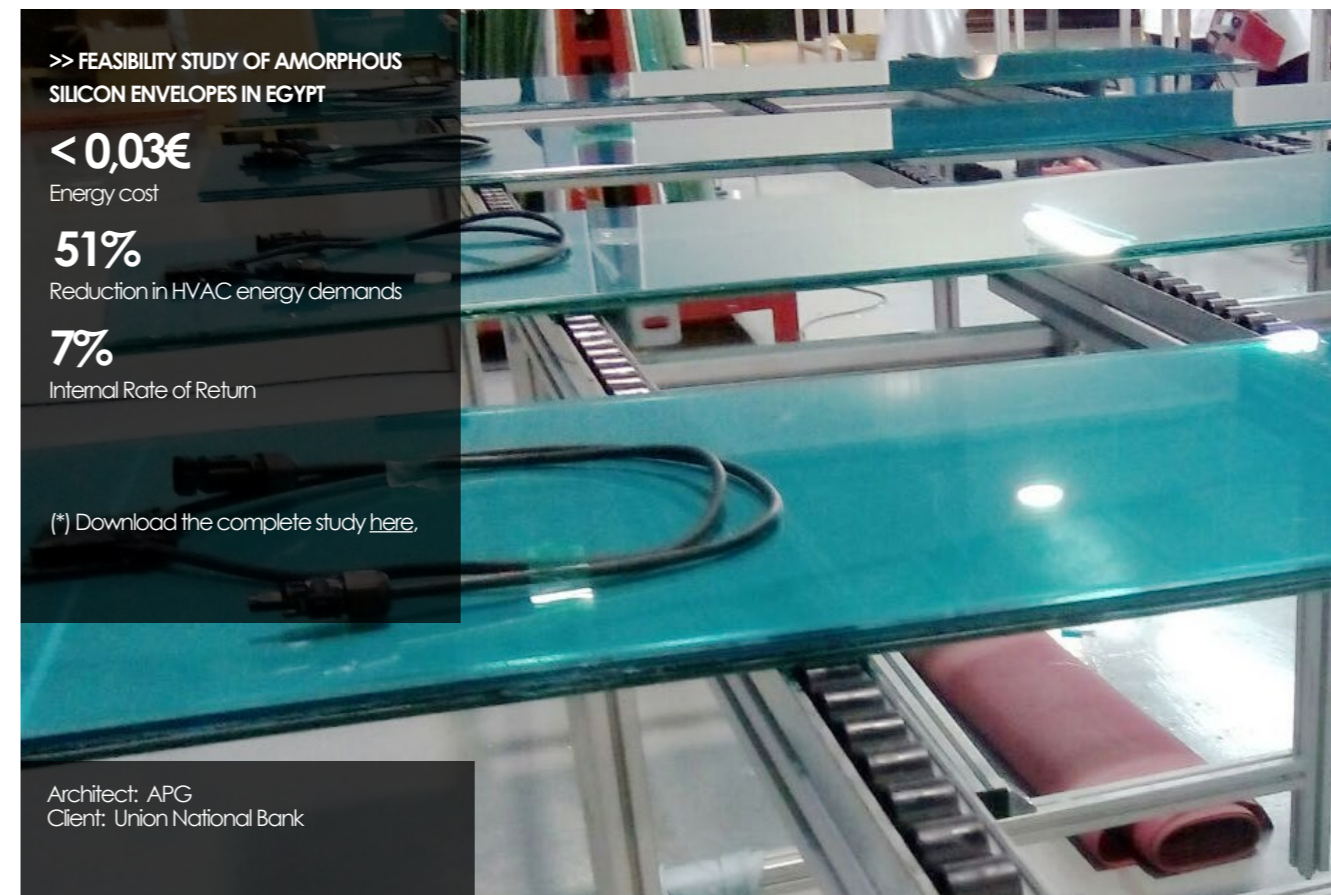


Onyx Solar® has installed a photovoltaic pergola in the university campus in order to provide shade while generating electricity.

The pergola, designed totally to measure, combines varied **monocrystalline silicon** glass by Onyx Solar®. These generate **14,392 kWh** for the university, preventing the release of almost **10 tons of CO₂** into the atmosphere.

UNION NATIONAL BANK

PHOTOVOLTAIC ENVELOPE



>> FEASIBILITY STUDY OF AMORPHOUS SILICON ENVELOPES IN EGYPT

< 0,03€
Energy cost

51%
Reduction in HVAC energy demands

7%
Internal Rate of Return

(*) Download the complete study [here](#).

Architect: APG
Client: Union National Bank

The Union National Bank (UNB), located in the financial and commercial area of Giza, is the new headquarters of the bank in this Egyptian city.

UNB is one of the main Egyptian banks, standing out due to its provision of excellent services to its customers and achieving the best performance possible for its shareholders.

The solution which Onyx Solar® has integrated into this new 16-storey building consists of the inclusion of photovoltaic glass on the façade and rooftop of the same, with a total of **439 m²** of integrated photovoltaics with **20.61 kWp** of peak installed power.

On the one hand, blue **amorphous silicon** glass of two different sizes were used for the main and lateral façades, featuring a **M vision (10%) semi-transparency degree**. On both façades a double-skin system is used, where the glass is installed on a metallic structure, forming a geometric pattern on the façade.

On the other hand, the panes integrated on the building rooftop are made of **monocrystalline silicon** and provide a peak power output of **28.08 kWp**.



The installation of Onyx Solar®'s photovoltaic technology at the Union National Bank enables the generation of over **61,000 kWh** per year, enough to power **3,482 lights** and to prevent the release of **41 tons of CO₂** into the atmosphere.

CHANCERY LANE

PHOTOVOLTAIC SKYLIGHT



>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN LONDON

< 0,05€

Energy cost

14%

Reduction in HVAC energy demands

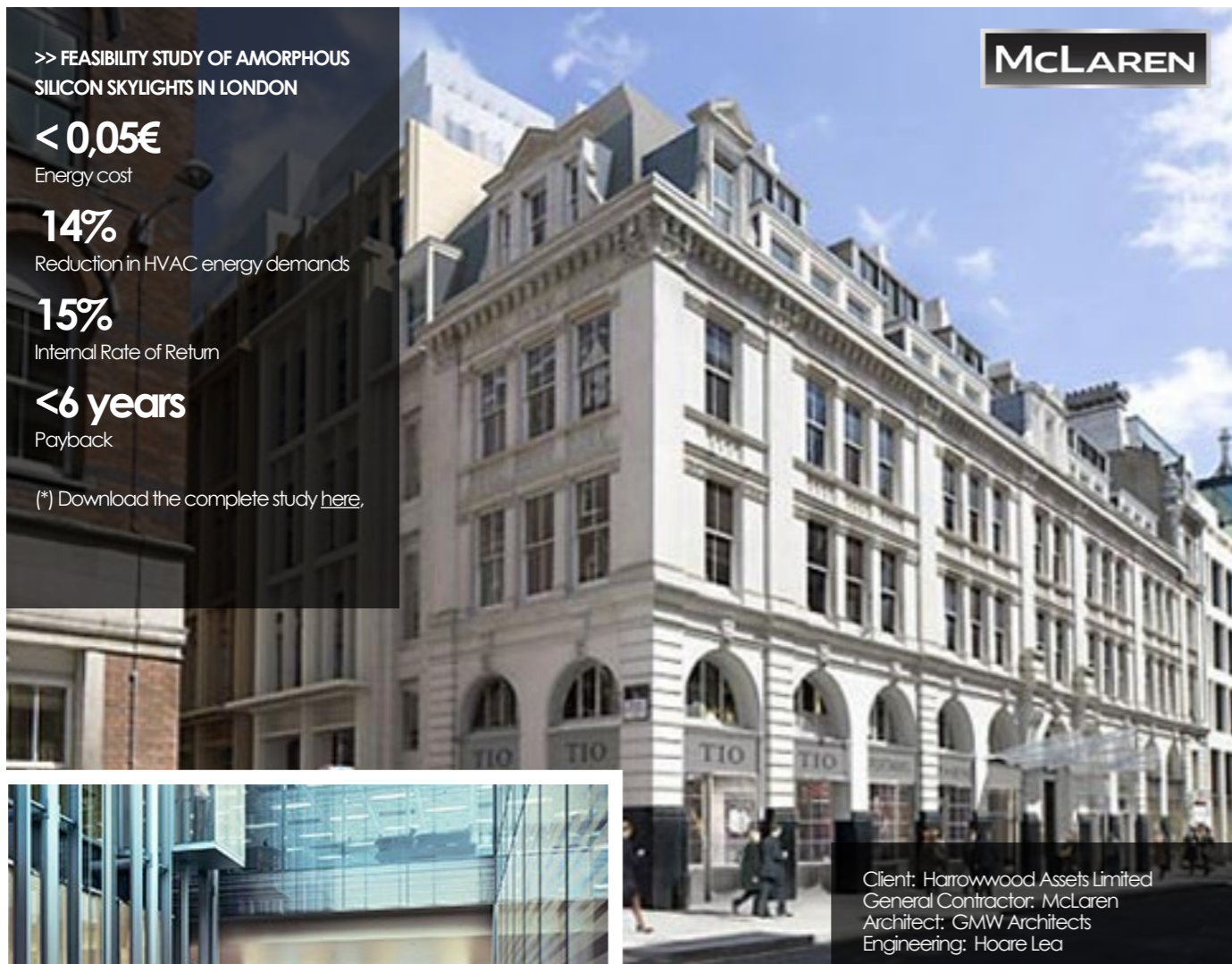
15%

Internal Rate of Return

< 6 years

Payback

(*). Download the complete study [here](#).



Client: Harrowood Assets Limited
General Contractor: McLaren
Architect: GMW Architects
Engineering: Hoare Lea

130 m² skylight integrating solutions developed by Onyx Solar®

The objective is to optimise the production of power while avoiding structural modifications and respecting the design of the building. For this reason, Onyx Solar® is an optimal choice, as it provides protection against the sun and generates power while improving the aesthetic appearance.

The panes forming the skylight are made of **amorphous silicon** with a **L vision (20%) of semi-transparency degree**. In addition to providing power in situ, these also provide natural lighting, ultraviolet and infrared radiation filter, and permanent protection against the climatic conditions of London.

Onyx Solar®'s solution for this skylight generates a total of **3,700 kWh** per year, making possible the powering of **210 lights** and preventing the release of **2.5 tons of CO₂** into the atmosphere. The total installed power is **34 kWp**.

Located in the heart of London's legal district, this building of nearly **10,000 m²** is a renowned project executed by the **McLaren Construction Group**.

The building, consisting of 9 storeys of modern offices and of which Harrowood Assets Limited is proprietor, features a

THE AUTONOMOUS OFFICE

PHOTOVOLTAIC FAÇADE

>> FEASIBILITY STUDY OF AMORPHOUS SILICON FAÇADES IN ASTURIAS

< 0,04€

Energy cost

30%

Reduction in HVAC energy demands

27%

Internal Rate of Return

< 5 years

Payback

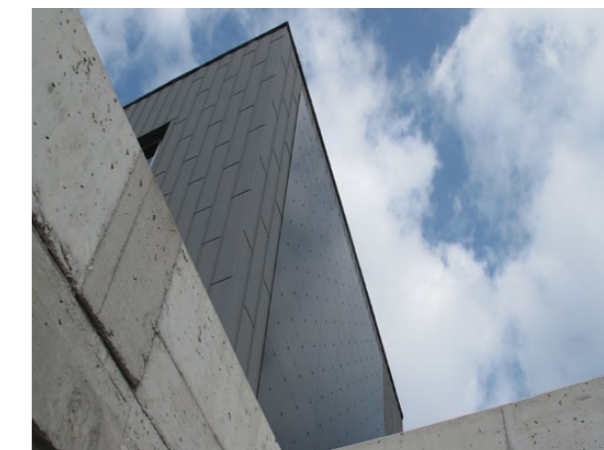
(*). Download the complete study [here](#).



The Autonomous Office is a project located in the Science and Technology Park at Gijón, in Asturias (Spain). This Park is the location of reference in Gijón destined for the establishment of knowledge-intensive companies, the performance of R&D&i activities and the development of new pathways for technology transfer.

The objective of the "Autonomous Office" project is the construction of a sustainable, energetically self-sufficient building which will reduce the environmental footprint to a minimum; for this reason it has been awarded the **LEED Platinum Certificate**.

The development company for the construction of the building is Biogas Fuel Cell (BFC), devoted to the recovery and management of organic waste by its transformation into biogas.



Onyx Solar® is participating with the installation in the building of various integrated photovoltaic solutions, which are the main source of power generation. Thus, by **replacing traditional building materials with multi-purpose photovoltaic materials**, in addition to creating clean, cost-free electricity from the sun, the power requirements of the air handling and lighting systems are also reduced by controlling the sunlight and increasing thermal and acoustic insulation.

The photovoltaic technology employed on two of the façades of this building is **CIGS technology** (Copper, Indium, Gallium and Selenium), which produces a peak installed power of **24.5 kWp** and which will generate **10,686 kWh** per year. It will also prevent the release of **3 tons of CO₂** into the atmosphere.

The project is co-financed by the European Union via the LIFE+ programme in the thematic field of Environmental Policy and Governance (LIFE11 ENV/ES/000622).

BOUTIQUE HOTEL

PHOTOVOLTAIC ROOF

>> FEASIBILITY STUDY OF CRYSTALLINE SILICON SKYLIGHTS IN CALIFORNIA

< 0,01€

Energy cost

85%

Reduction in HVAC energy demands

90%

Internal Rate of Return

< 1 years

Payback

(*) Download the complete study [here](#).

Client: Soorya Unlimited

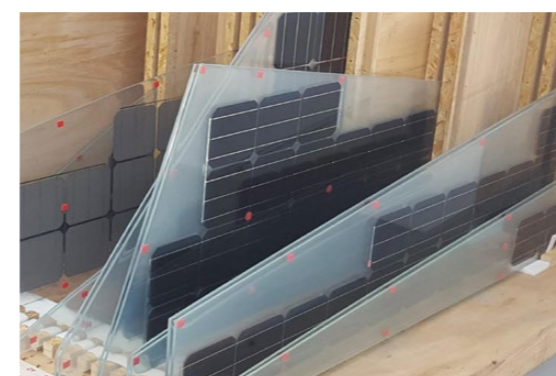
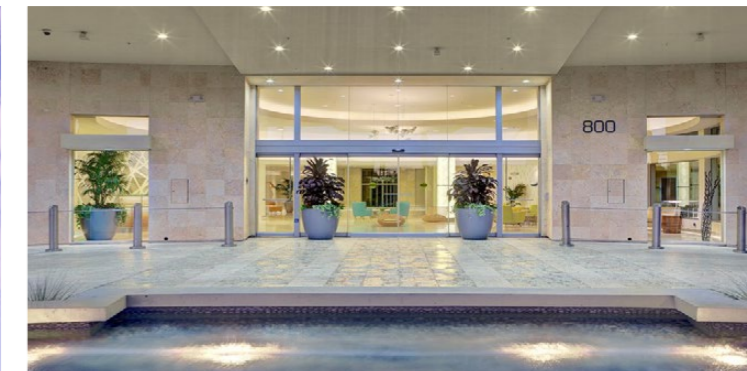
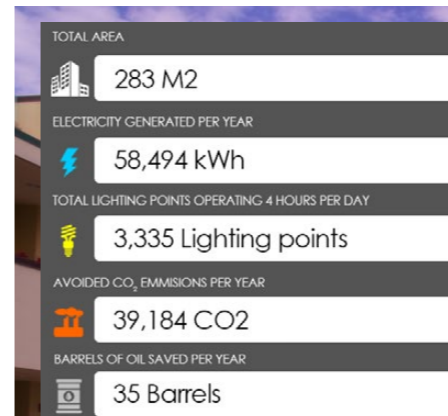


This solar PV System at the Pier South - A Marriott Autograph Collection Hotel & Resort located in Imperial Beach, CA - at the beach front, demonstrates that **designing with PV Glass has almost no limits.**

Modern in every sense, the Pier South stands out for being a sustainable and environmentally friendly building awarded **LEED Silver Certification** (Leader in Energy and Environmental Design), thanks to the innovative solutions brought by Onyx Solar® through Soorya Unlimited, a Californian company specializing in solar energy and project development.

Soorya Unlimited proposed a solution that included photovoltaic technology in the hotel, for which Onyx Solar® is a safe bet in the design of such photovoltaic construction solutions.

The objective of creating a fully customizable solution in the form of a photovoltaic roof, which requires **greater aesthetic appearance**, was achieved through the design of custom-shaped glass modules with more than **55 different shapes**, fully frameless.



The PV Glass, designed and manufactured by Onyx Solar®, is composed of **crystalline silicon** solar cells, reaching an installed capacity of **38 kWp**. This solution enables the Pier South to generate **58,500 kWh** annually, destined for the building's self-consumption, thereby preventing the emission of **39 tonnes of CO₂** into the atmosphere.

The installation by Soorya Unlimited is flat on the roof and ballasted so no penetrations are done in roof. Additionally, some string lights under the entire array will be installed to enhance the aesthetics further -when lit at the night, they will make the whole roof look like a dance floor. This luxury complex has 78 modern guest rooms with private balconies overlooking spectacular views of the Pacific Ocean. For sure, it is a place where sustainability and relaxation meet.

BELL WORKS LABS HEADQUARTERS

PHOTOVOLTAIC SKYLIGHT



>> FEASIBILITY STUDY OF AMORPHOUS SILICON SKYLIGHTS IN NEW JERSEY

< 0,01€

Energy cost

19%

Reduction in HVAC energy demands

55%

Internal Rate of Return

< 2 years

Payback

(*) Download the complete study [here](#).

General Contractor: Structure Tone
Structural Engineer: LaufsED
Client: Somerset Development New Jersey

As a part of the complete revitalization of the two-million-square-foot former Bell Labs facility into an iconic mixed-use metrosuburb located in Holmdel, N.J., Onyx Solar will be supplying Bell Works with 60,000 SqFt of amorphous Silicon photovoltaic glass, to create the largest-of-its-kind photovoltaic skylight in the USA.

Upon completion, the PV skylight will both naturally illuminate the complex while generate free, clean electricity from the sun. It will simultaneously offset approx. 60 tons of annual CO2 emissions, drastically improving the building's energy efficiency and reducing its carbon footprint. As an example, the annual energy generated would provide enough power to drive 100 electric cars along 4,250 miles per year.

Utilizing state-of-the-art technology, Bell Works' skylight will feature 24 different glass units from Onyx Solar to cover the various unique skylight schemes at the Eero Saarinen-designed architectural gem. Each will be comprised of amorphous Silicon thin film photovoltaic (a-Si PV) active glass, laminated between two sheets of tempered safety glass, allowing for 20% Visual Light Transmittance (VLT) to reduce solar heat gain while producing energy, all while preserving Bell Work's historical design.

"At Onyx Solar we feel that we are giving back to a building that has witnessed the discovery of so many innovations, including the solar cell. Ralph and his team are taking on a great mission with Bell Works; congratulations on the efforts," said Diego Cuevas, Onyx's VP Business Development.



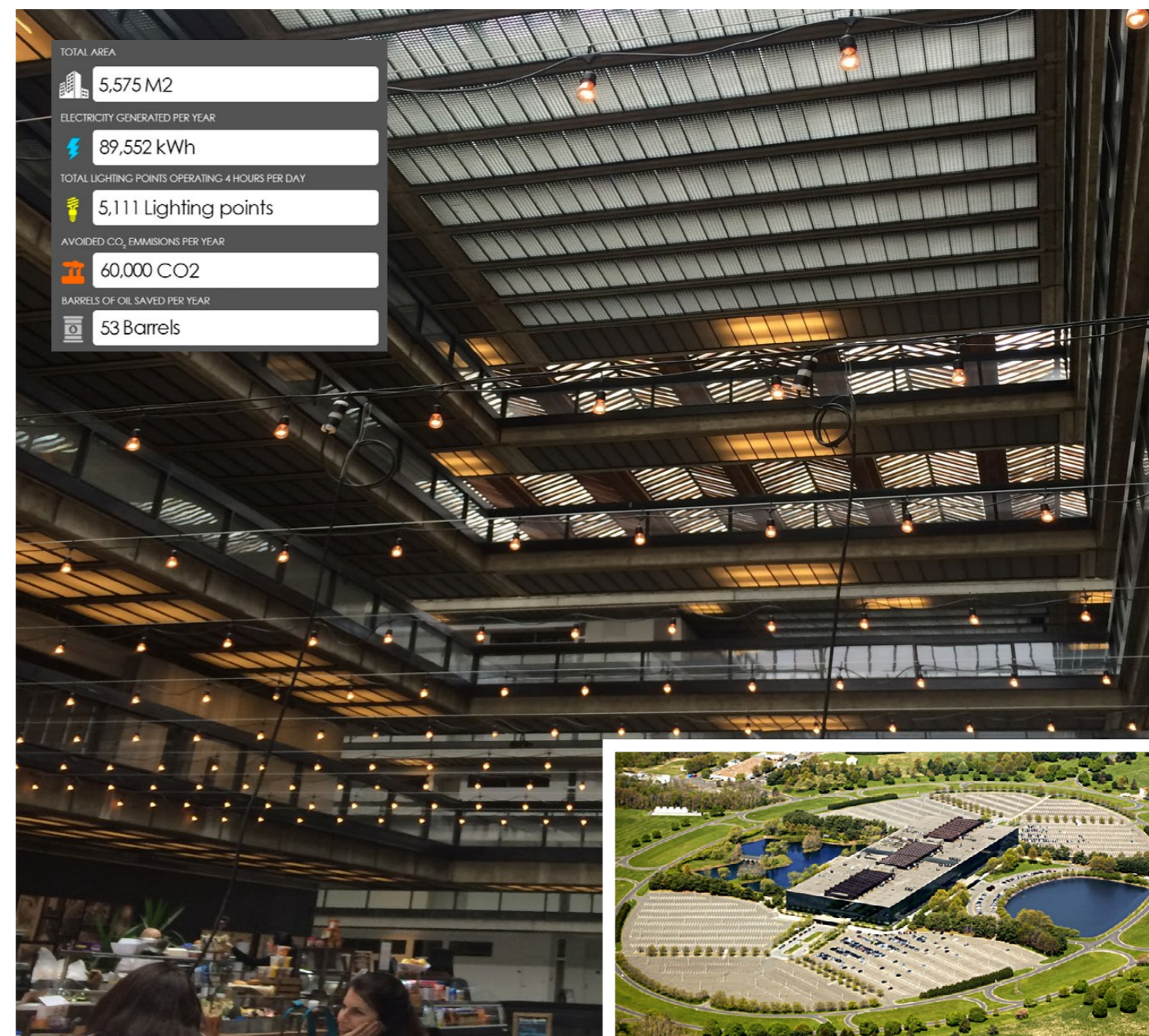
"Bell Works is already home to an extraordinary community of innovators, and it's our job to continue to innovate the building commensurately.

People want a workplace that extends itself beyond professional needs one that stands for something beyond the cubicle walls. As Bell Works continues to attract some of the region's most forward-thinking companies, it is only fitting that it incorporates the latest in sustainable technology, all in a way that is both functional and attractive."

Ralph Zucker, President of Somerset Development of Bell Works.

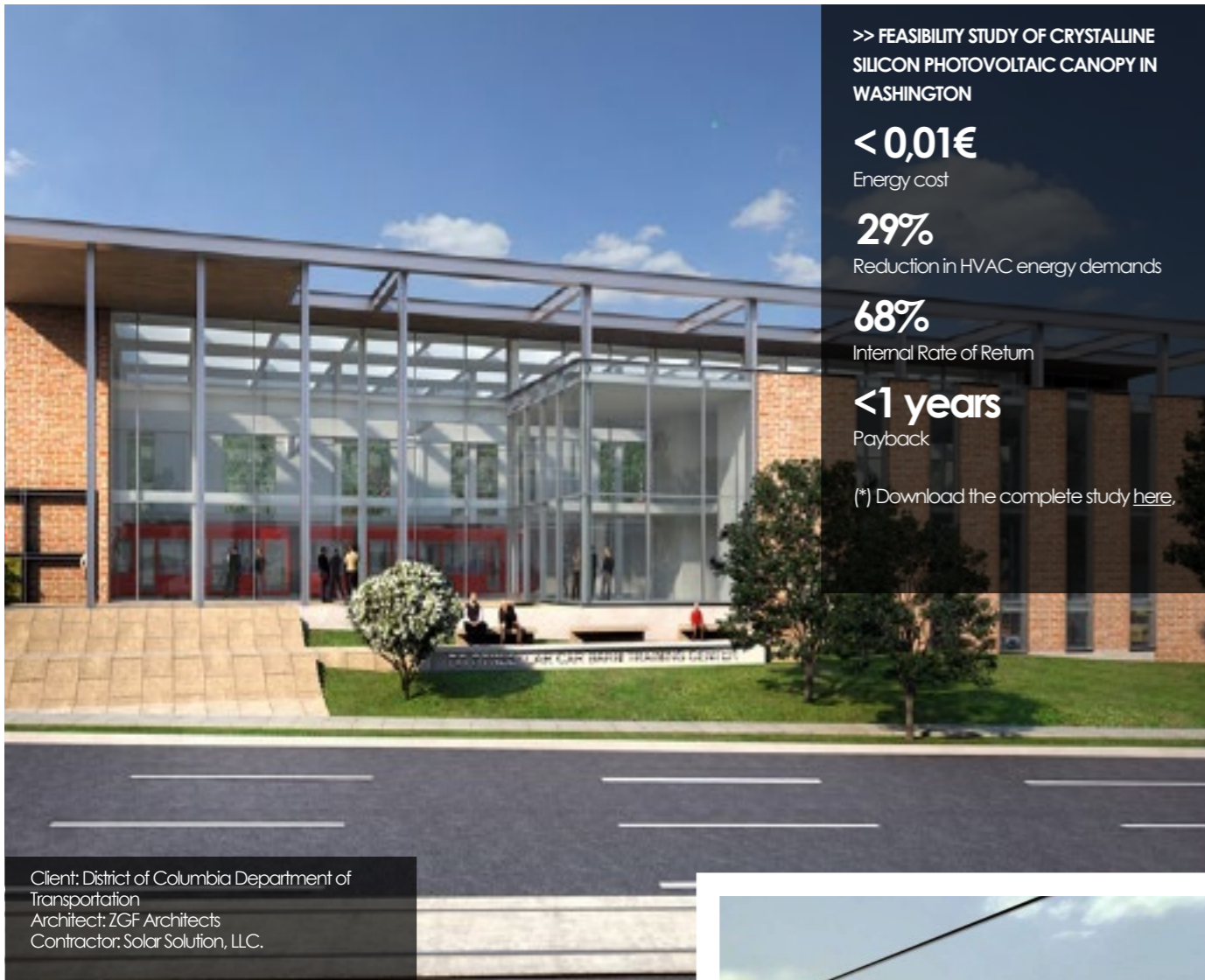
Originally constructed between 1962 and 1982, the building is revered for its role in spurring the development of some of the world's foremost inventions and research concepts, including the first practical solar cell. Furthermore, it was home to seven Nobel Prize award winners, among others.

Today, Somerset Development is transforming the building into a mixed-use 'metrosuburb,' complete with offices, retail, dining, healthcare, recreation, and hospitality, and it is set to become a world-class center for entrepreneurship and innovation.



STREETCAR CARBARN TRAINING CENTER

PHOTOVOLTAIC CANOPY



>> FEASIBILITY STUDY OF CRYSTALLINE SILICON PHOTOVOLTAIC CANOPY IN WASHINGTON

< 0,01€

Energy cost

29%

Reduction in HVAC energy demands

68%

Internal Rate of Return

< 1 years

Payback

(*). Download the complete study [here](#).

Client: District of Columbia Department of Transportation
 Architect: ZGF Architects
 Contractor: Solar Solution, LLC.

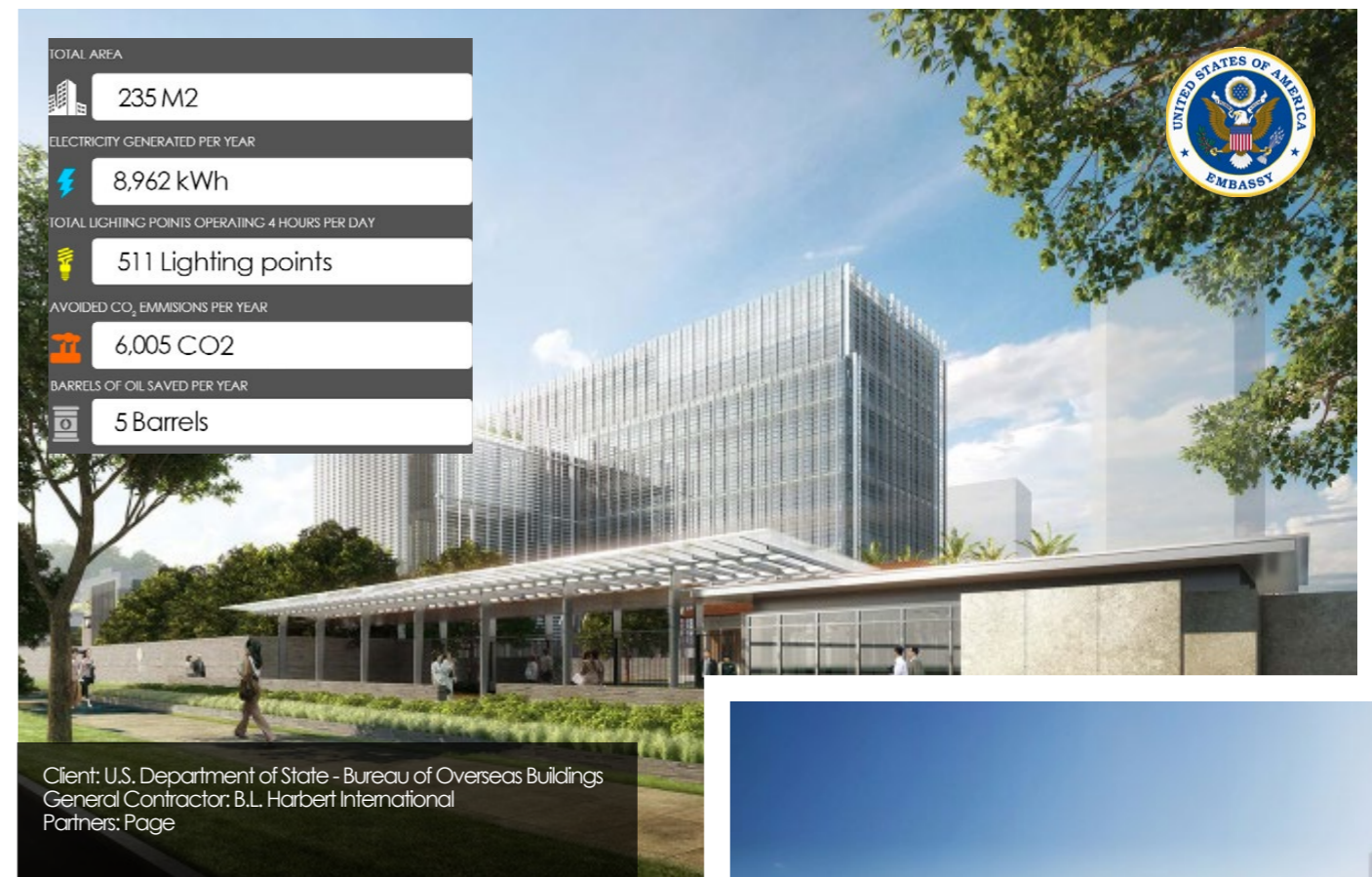
Designed by ZGF Architects, this new Car Barn Training Center located in the Washington, D.C. area incorporates a photovoltaic canopy using Onyx Solar's mono-crystalline Silicon glass on glass units.

The PV Glass make up consists of two layers of 5/16" fully tempered glass with 36x 6" cells embedded in between them. The glass design comes with drills to accommodate spider fittings, and the total system size is 5.76 kWp.



US EMBASSY OF JAKARTA

PHOTOVOLTAIC CANOPY



Client: U.S. Department of State - Bureau of Overseas Buildings
 General Contractor: B.L. Harbert International
 Partners: Page

Designed and built by renowned BL Harbert International, this new state-of-the-art, 47,000 Sqm complex will incorporate a photovoltaic canopy made with Onyx Solar's amorphous Silicon semi-transparent glass.

Each glass offers a 10% LT and filters 99% of harmful UV radiation; the total system size is 9.4 kWp, and it will help reducing the building's carbon footprint while decreasing its electricity bill.

The embassy is located in the historic center of Jakarta, surrounded by national government offices. Upon completion,



it will provide workspace for approx. 1,300 employees, who will enjoy the benefits of green building practices.

CULVER CITY CREATIVE

CURTAIN WALL



Culver City Creative, also known as C3, is an award-winning creative office building that emphasizes volume and flexibility with a highly customizable modern design by Gensler, the largest architectural firm in the world.

The C3 building offers 281,400 SqFt of unique creative office space to fit the needs of westside media, technology and entertainment, as well as emerging high-growth tenants



looking for a collaborative, high-energy campus environment.

Engulfed by the Silicon Beach wave, home to the world's most forward-thinking companies, C3's location blends a surrounding tech workforce with desirable distinct residential communities. It is just a few minutes away from the Culver City Transit Center and Metro Expo Line, as well as at a walking distance to the recently renovated Westfield Culver City Mall.

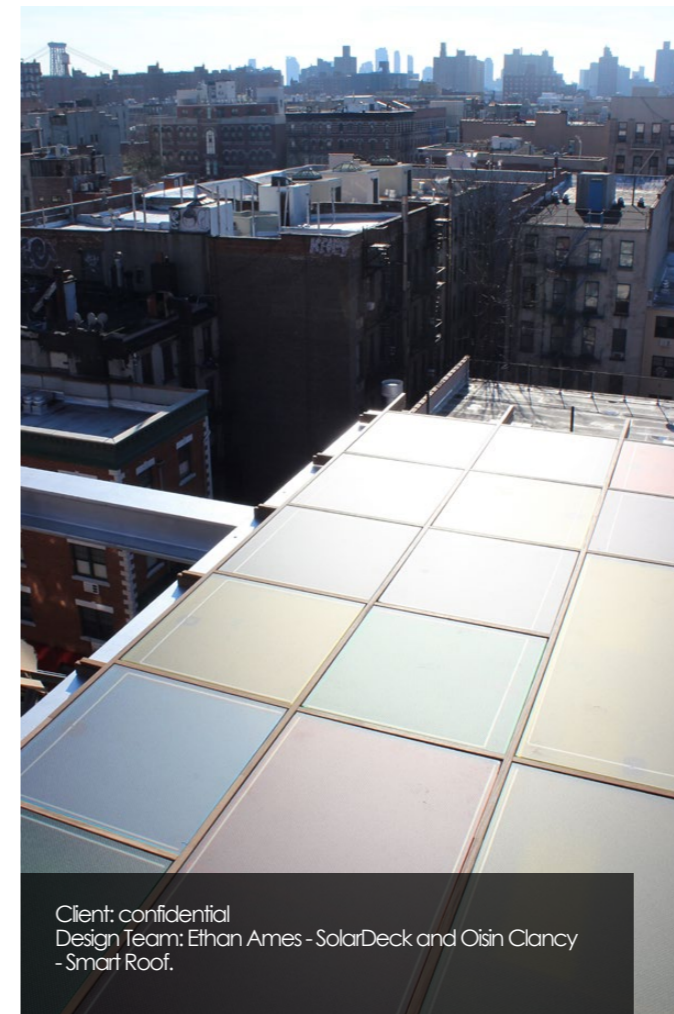
C3 outstanding project integrates a PV curtain wall by Onyx Solar of 8,000 square feet, comprised by up to 24 different types of amorphous silicon PV glass. It is the company's first curtain wall project developed in the United States.

This aesthetic architectural solution will generate 30,976 kWh and will prevent the release of 20,754 Kg of CO₂ into the atmosphere every year.



LOWER EAST SIDE PRIVATE RESIDENCE

PHOTOVOLTAIC FLOOR



In Manhattan, New York, this private residence in the Lower East Side has trusted Onyx Solar for the installation of a photovoltaic walkable floor for the renovation of its penthouse.

This project has been carried out along with Solar Deck combining photovoltaic glass pieces of multiple colors and sizes in the outdoor space of the terrace. Up to 50 units of pavers of different dimensions are placed in a surface of 215 square feet. Its LED lighting will certainly intensify the vibrant colors of the units.

>> FEASIBILITY STUDY OF AMORFOUS SILICON SKYLIGHTS IN NEW YORK

< 0,01€
Energy cost

19%
Reduction in HVAC energy demands

55%
Internal Rate of Return

< 2 years
Payback

(*) Download the complete study [here](#).

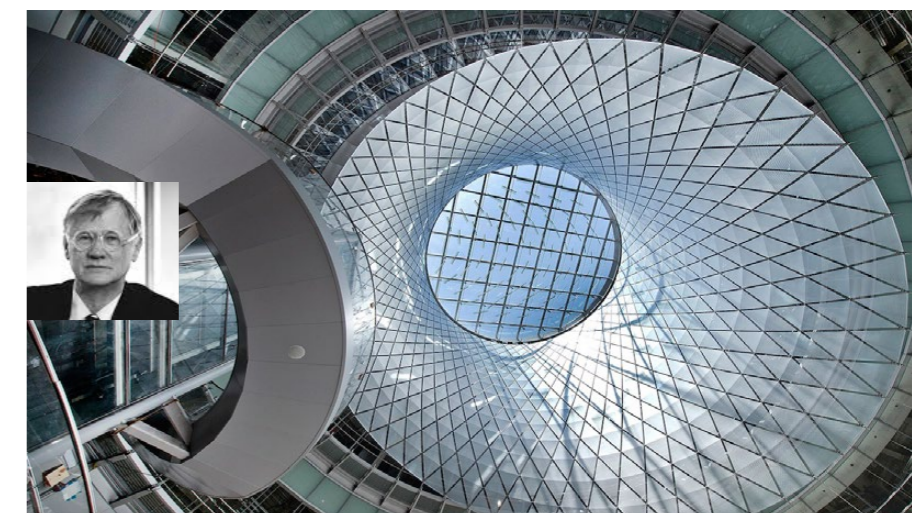
A great retrofit project by Onyx Solar which represents a perfect breakthrough solution for a better use and performance of the city's highly expensive soil. It fulfils all safety standards complying with non-slip regulations and it is beautifully integrated into the building.

Onyx Solar® collaborates in projects designed by the most renowned architect's studios worldwide, who know full well the exceptional value that photovoltaic glass contributes to their projects.

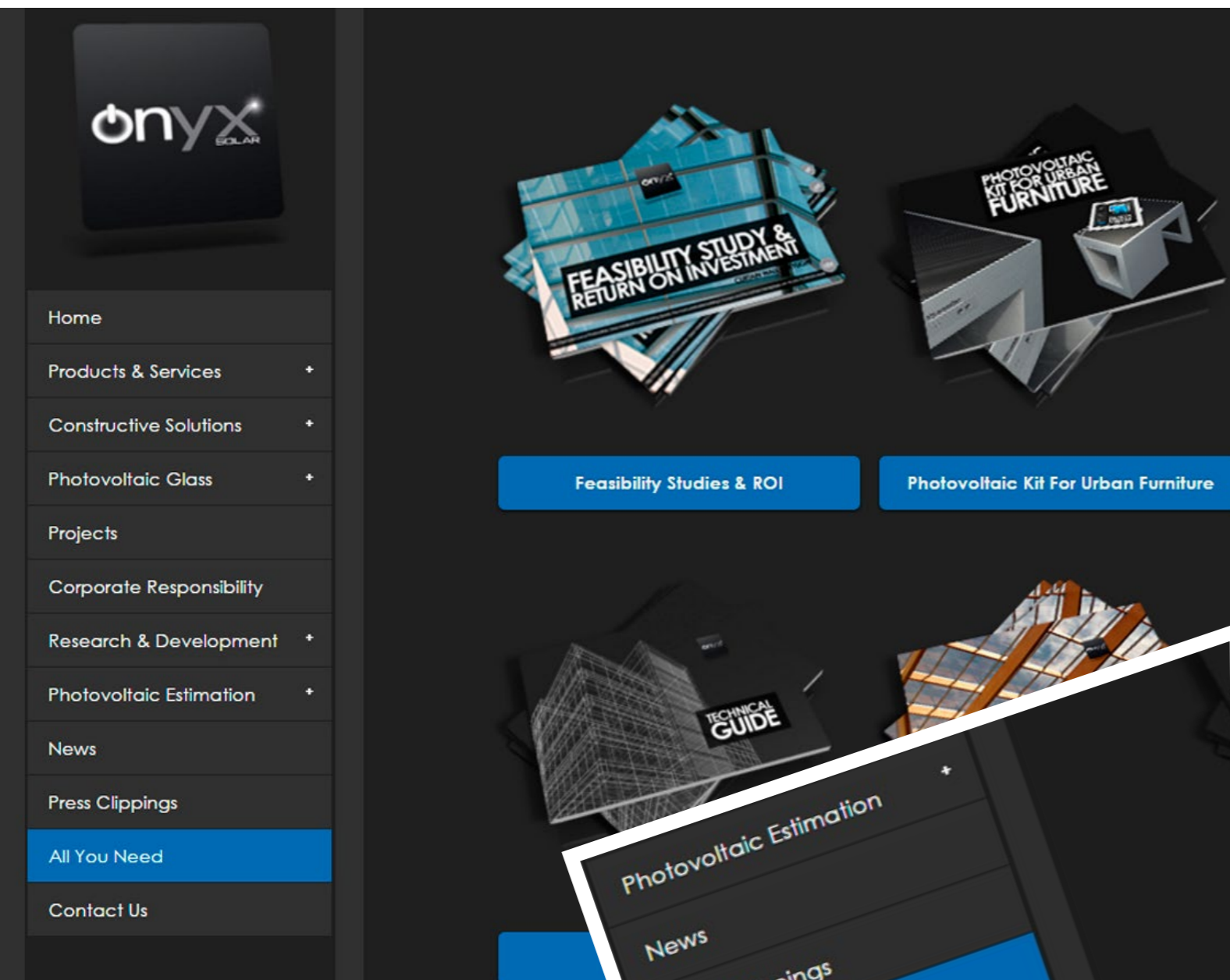
Onyx Solar® has gained the confidence of these firms, to whom it gives guidance regarding the inclusion of this innovative product in their exceptional designs.

In the words of Norman Foster, "Building-integrated photovoltaics is not a question of fashion, but of survival".

Welcome to the Revolutionyx.



ALL YOU NEED



Onyx Solar® places at the disposal of its clients and motivators the section "ALL YOU NEED".

In this section of the website they will be able to find all the information necessary to discover our technology, projects, and all the documentation necessary to facilitate the specification, prescription and installation of our photovoltaic glass in their projects.

RETURN ON

RETURN ON INVESTMENT FOR A DEMO BUILDING



PAYBACK	(years)	2
ANNUAL IRR	(%)	70%
DECREASE IN AIR HANDLING REQUIREMENTS	(%)	48%
COST OF ENERGY WITH ONYX SOLAR GLASS	(Eur/kWh)	0,01 €
SAVINGS IN ENERGY COST	(%)	89%

* Average values for one of Onyx Solar's photovoltaic skylights using amorphous silicon technology

Now you can **download the feasibility studies of several of our construction solutions in over 130 cities worldwide.**

From San Francisco to Sydney via Copenhagen, the remarkable profitability of Onyx Solar®'s glass is far above what is considered acceptable for traditional photovoltaic modules, being estimated at 7.4%.

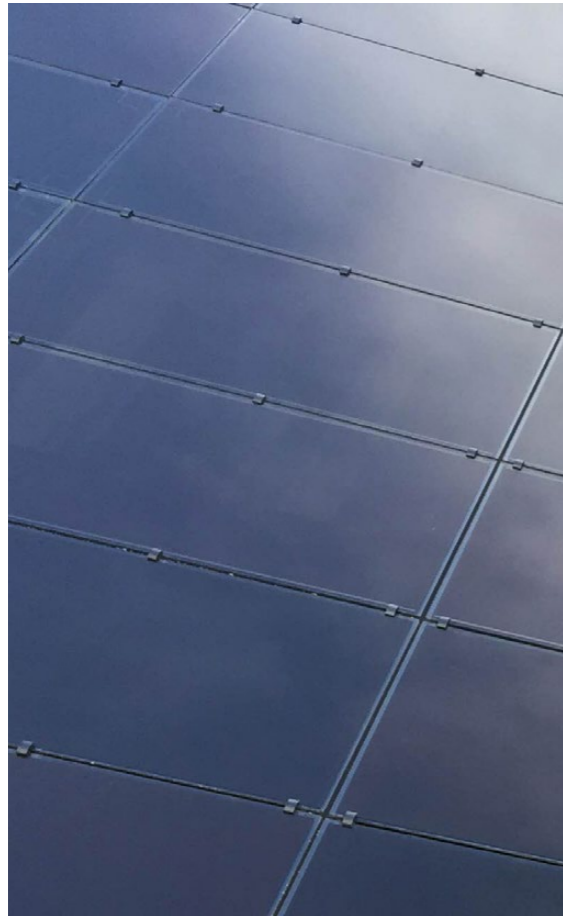
This is a useful tool with which to discover the economic advantages of integrating, in the average building, photovoltaic glass as compared to conventional glass. Advantages derived from the cost-free generation of power combined with improvements in the envelope which cause **the energy requirements of the building to drop by an average of 48%, and occasionally by as much as 100%.**

Due to these energy savings, the output of Onyx Solar®'s photovoltaic glass yields an awesome **average Internal Rate of Return of 70%**, and a **payback time of less than 2 years over most of the planet**, and in many cities of only a few months.

Consult the Feasibility Studies of your city and discover how to **pay less than one cent per kWh**, also avoiding increases in your electricity bill indefinitely.

The Feasibility Study of your city can be downloaded from Onyx Solar®'s website or via a mobile application, to discover all the advantages of integrating photovoltaic glass into your building.

OUR FACTORY

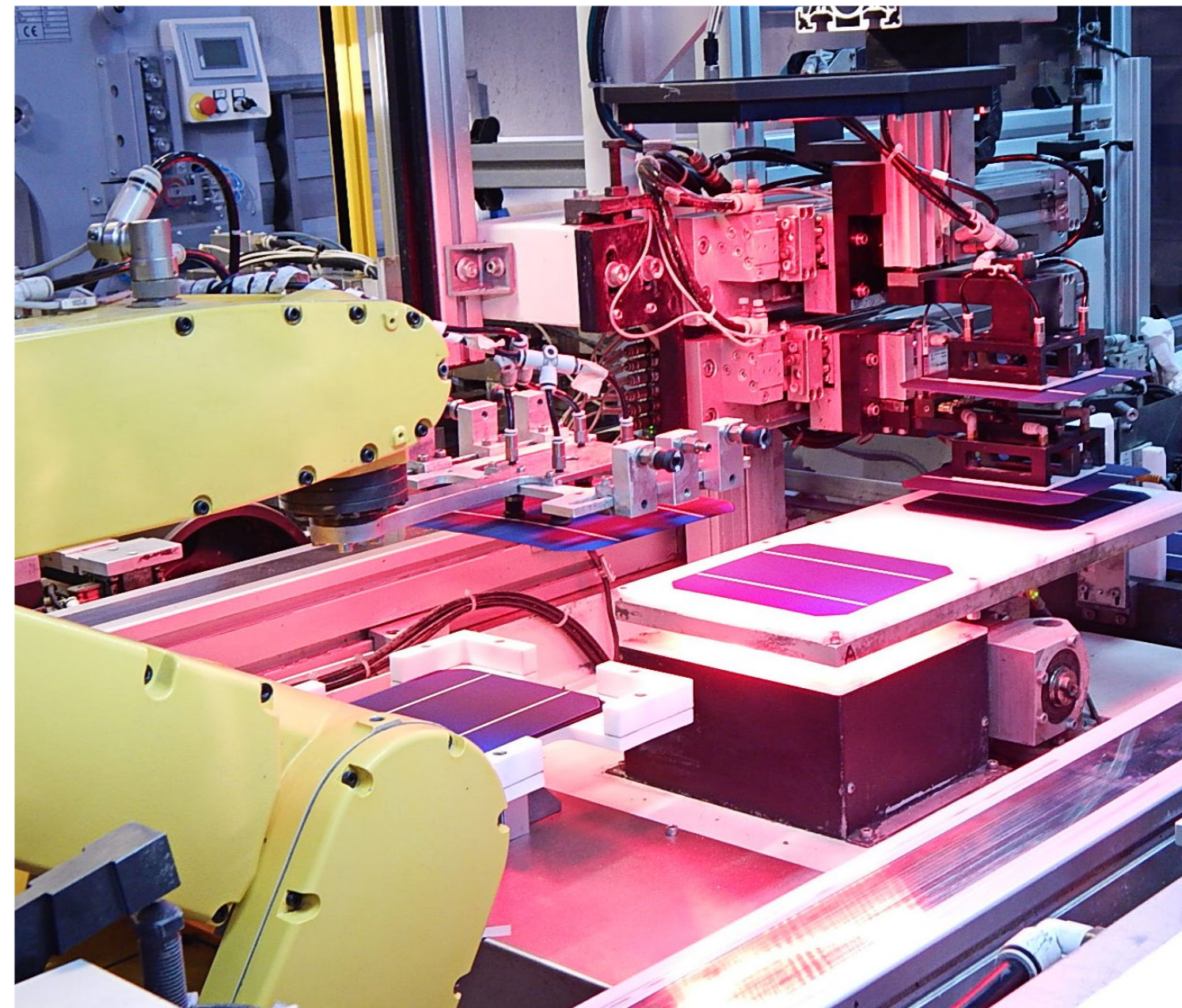


Onyx Solar® is a leading European company in the design and manufacture of photovoltaic glass capable of generating clean, free energy from the sun.

The factory, located in Avila (Spain), is a facility of 8,000 m² with cutting-edge technology and machinery, enabling the company to achieve a **production capacity of 500,000 m² of**

amorphous and crystalline silicon photovoltaic glass.

A glass which **complies with the highest functionality, quality and safety standards, and which has already been installed in over 22 countries.**



This range of photovoltaic solutions has been developed by a highly-qualified multidisciplinary team of physicists, architects and engineers, with a total of **over 15 years' experience in engineering and the installation of photovoltaic technology.**



RESEARCH AND DEVELOPMENT

R+D+i

Since its commencement, Onyx Solar® has been committed to investment in R&D+i as the key to the development of its innovative products, and has therefore participated in several R&D+i projects with renowned universities, research centres and leading companies.



PVSITES (Building-integrated photovoltaic technologies and systems for large-scale market deployment)

Programme: HORIZON 2020. European Commission.



ADVANCED BIPV (New Generation of BIPV glass with advanced integration properties)

Programme: HORIZON 2020 - SME Instrument Phase 2. European Commission.



REELCOOP (Research Cooperation in Renewable Energy Technologies for Electricity Generation)

Programme: 7 Framework Programme. European Commission.



HERB (Holistic Energy-Efficient Retrofitting of Residential Buildings)

Programme: 7 Framework Programme. European Commission.



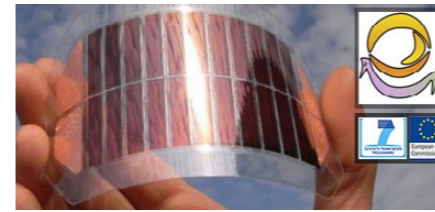
R2CITIES (Renovation of residential urban spaces: towards nearly zero energy cities)

Programme: 7 Framework Programme. European Commission.



REELCOOP (Research Cooperation in Renewable Energy Technologies for Electricity Generation)

Programme: 7 Framework Programme. European Commission.



ARTESUN (Efficient, large-area arbitrary shape solar energy)

Programme: 7 Framework Programme. European Commission.



The Autonomous Office

Programme: LIFE 2011. European Commission. Environment.



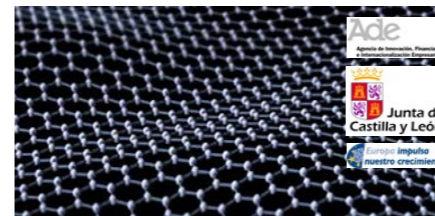
EUROPHIT (Improving the energy performance of step-by-step refurbishment and integration of renewable energies)

Programme: CIP Programme. Intelligent Energy Europe.



SOHIRE (Hybrid and Reactive Solution for Integration into Sustainable Building Envelopes)

Programme: Cooperative Research and Development Projects. CDTI - Centre for Industrial Technological Development.



Solid-state Dye-Sensitized Solar Cells: nanostructured layers forerunning photovoltaic paint in sustainable construction

Programme: R&D projects. Business Innovation, Financing and Internationalisation Agency. Regional Government of Castille and Leon.



INNDISOL (Innovation in Architectural Solar Integration and Photovoltaic Devices)

Programme: INNPACTO 2010. Spanish Ministry of Economy and Competitiveness.



EVERCLEAN (Durable self-clean coating for solar panels to improve PV energy generation efficiency)

Programa: HORIZON 2020. European Commission.



PVCOM (Multifunctional photovoltaic devices based on transparent composite and CIGS for integration)

Programa: Eurostars. European Commission.

CERTIFICATIONS

QUALITY

IEC CERTIFICATION

The International Electrotechnical Commission certifies compliance with the IEC 61215:2005 for photovoltaic modules of crystalline silicon for ground use and its manufacturing process.



UL CERTIFICATION

The UL Mark certifies compliance with the safety standards UL 1703 and ULC/ORD-C1703 for Photovoltaic Glass Building Integration.



RESILIENCE AND SAFETY OF LAMINATED GLASS

Onyx Solar has passed the strictest tests of resilience and safety on its laminated glass. It has been certified by TECNALIA, in compliance with the UNE-EN 14449:2006 Standard.



INTEGRATED QUALITY MANAGEMENT SYSTEM

Quality management system in accordance with the ISO 9001:2015 Standard. Guaranteed by IQNET and AENOR.



Environmental Management System in accordance with the ISO 14001:2015 Standard. Guaranteed by IQNET and AENOR.



AWARDS AND RECOGNITIONS



We must commit ourselves to innovation, technology and internationalisation as the driving force behind development and growth".

Álvaro Beltrán, President and founder of Onyx Solar®.

Best PV glass manufacturer 2016 in the Clean Energy Awards, awarded by Global Energy News magazine.

Best Global Photovoltaic Glass Provider in the Sustainable Building Awards 2016, awarded by Build Magazine.

Best Photovoltaic Glass Project for the skylights installed in the American Airlines in the Sustainable Building Awards 2016, by Build Magazine.

Product and Service for Sustainable Development 2016 in the European Business Awards for the Environment.

Most Sustainable material in the WSSET INNOVATION AWARDS 2016.

Global Leader for Building Integrated Photovoltaic Glass in 2016 by Frost & Sullivan Leadership Award.

Best project in Colorado in 2015 awarded by the ENR magazine for the Denver Science Pyramid.

Kuwait award for Excellence in Sustainable Energy 2015 for "the most innovative sustainable technology".

Best of What's New award 2015 by the Popular Science magazine for the "best engineering product".

Best turnkey project 2015 in the Solar Industry International Awards in Hamburg.

Best outdoor product 2015 by The Architects' Newspaper magazine for the photovoltaic floor.

The most innovative glass 2015 awarded by the National Glass Association and Window & Door, for low-e photovoltaic glass.

Best innovative project 2015 by El Mundo for the photovoltaic floor.

Innovative company 2015 - 1st Promecal Awards.

We are sustainable 2015 - "We are a company" awards, by the Popular Bank.

Best project in the New York area 2014 awarded by the ENR magazine for the Novartis project.

Most innovative product 2014 in the VIII Castille and Leon Economic awards for innovation, for the photovoltaic floor.

Finalist for the **most innovative project 2014** in the European awards for Regional Innovation.

Best entrepreneurial project 2013 in the V Eneragen -National Energy Awards- "from the idea to the company".

Finalist for the **best construction material 2013** in the VII NAN Architecture and Construction Awards, in the Walkways and Façades category.

Best revelation enterprise in Castille and Leon 2012 by the magazine Actualidad Económica.

1st Red Empreverde Awards 2012, Biodiversity Foundation.

Best entrepreneurial company 2011 in the XXI Entrepreneur Awards, by La Caixa & ENISA.

'Sapere Aude' for innovation and sustainability 2010 awarded by the Avila City Council.

Commitment to innovation 2010 awarded by CONFAE.

Best start-up 2010 in the 1st Castille and Leon Awards for Innovation.

Award for market feasibility in the European Solar Decathlon 2020 for the SML House.

Finalist for innovation in the **European Venture Contest 2010**.

European Commission Official Partner 2010 for "Sustainable Energy for Europe" for the San Anton Market project.

Company with the greatest growth potential in Europe 2010 in the European Entrepreneurial Awards.

XI Young Entrepreneur Award 2010.

More than 30 awards distinguish Onyx Solar® as the world leader company in photovoltaic glass for buildings.



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